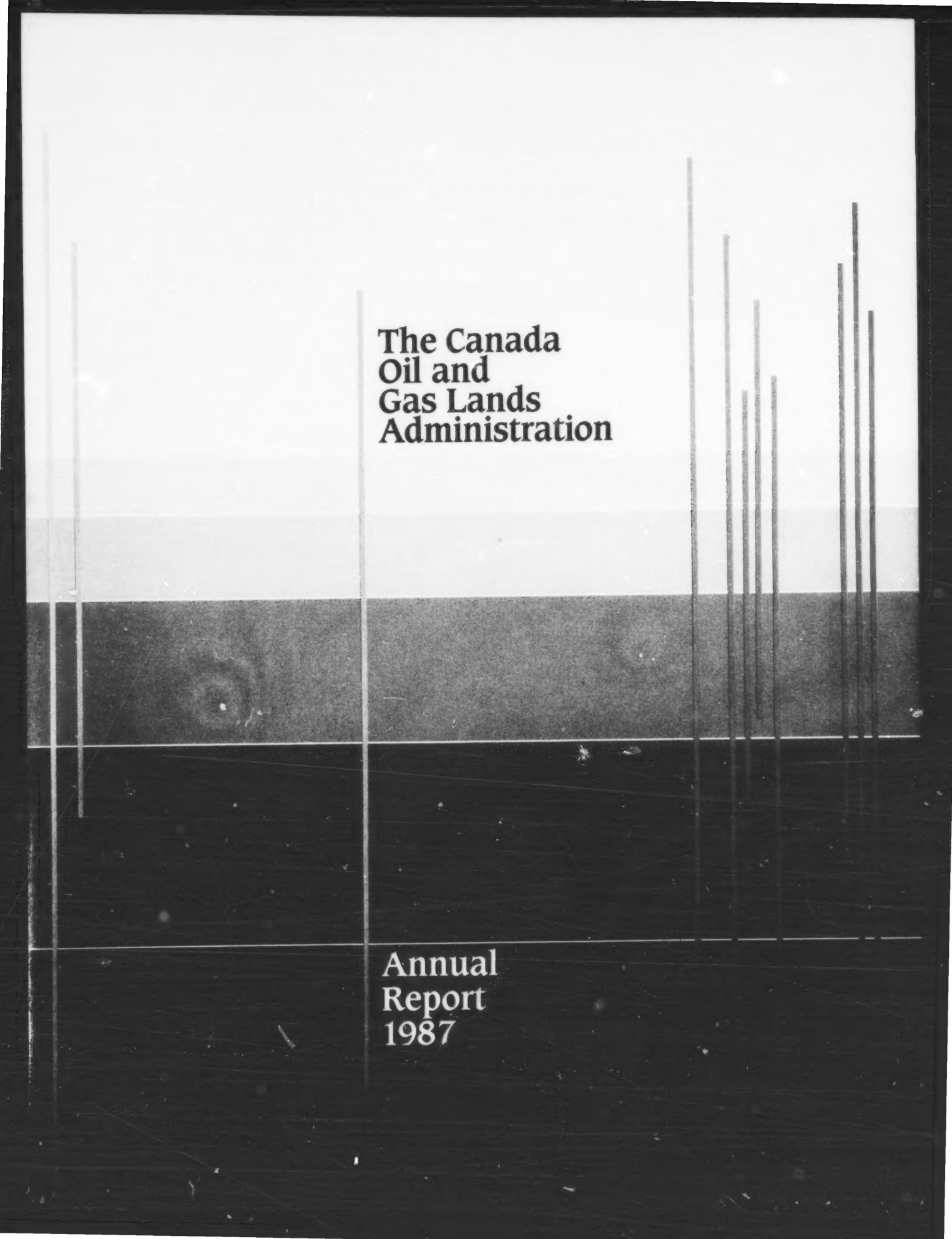

The Canada Oil and Gas Lands Administration

Annual Report 1987

92-00300/

Corporate Profile

The Canada Oil and Gas Lands Administration (COGLA) was established in 1981 by a Memorandum of Understanding between the Minister of Energy, Mines and Resources and the Minister of Indian Affairs and Northern Development.

COGLA is the federal government's principal contact with the oil and gas industry in matters relating to the regulation of oil and gas activity on Canada's frontier lands. These lands include the Yukon Territory, the Northwest Territories, Hudson Bay and most of the country's offshore areas. The Canada-Newfoundland Offshore Petroleum Board has had operational responsibility for the Newfoundland and Labrador offshore since January 1986. A new Canada - Nova Scotia Offshore Petroleum Board with operational responsibilities in the Nova Scotia offshore will be established following passage of legislation implementing the Canada - Nova Scotia Accord.

COGLA's prime responsibility is to regulate the exploration for and the development and production of oil and gas on Canada's frontier lands in a manner that ensures safety of the worker, effective resource conservation, protection of the environment, and full and fair access by Canadians to the benefits arising from activities related to the development of hydrocarbon resources.

COGLA has five branches:

The Rights Management Branch
The Engineering Branch
The Resource Evaluation Branch
The Environmental Protection Branch
The Policy Analysis and Coordination Branch

COGLA's regional office in Halifax had operational responsibility for the Nova Scotia offshore throughout 1987; the Yellowknife office had similar responsibilities in the North. These offices issue authorizations to drill wells, conduct regular inspections and monitor the engineering, geological and environmental aspects of all oil and gas industry operations, as well as ensure compliance with benefits plans.

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Message from the Minister of Energy, Mines and Resources, the Honourable Marcel Masse

Minister Marcel Masse

I have the honor of submitting to Parliament the sixth annual report of the Canada Oil and Gas Lands Administration (COGLA), the organization formed in 1981 to regulate petroleum activities on our frontier lands. Canadians recognize that this government has improved the overall approach to regulation of the energy industry, and COGLA has been a key player in this process.

The Frontier Energy Policy statement of October 1985 and the Canada Petroleum Resources Act, which became law in 1987, freed the oil and gas industry from excessive government intervention. Geology and economics have become the principal determinants of industry's decisions on exploration and development of Canada's frontier oil and gas resources.

On the East Coast, shared management arrangements with the provinces in the offshore have brought stability to industry decision making. During 1987, the Canada-Newfoundland Offshore Petroleum Board, a joint federal-provincial body established under the Atlantic Accord, completed its first full year of operation. Legislation to implement the Canada –Nova Scotia Accord and to establish a Canada – Nova Scotia Offshore Petroleum Board was introduced in the House of Commons and was being considered at the committee stage at year-end. The provincial bill to implement the accord was passed by the Nova Scotia Legislative Assembly in May.

On the West Coast, discussions took place with the Government of British Columbia concerning potential approaches to shared management in the offshore. The Government of Canada also considered approaches to a possible northern oil and gas accord.

One of COGLA's key responsibilities is to ensure that petroleum exploration, development and production on Canada's frontier lands are carried out with full regard for the safety of workers and the protection of the environment. COGLA continues to initiate research projects to increase the safety of petroleum workers in offshore and onshore frontier lands.

COGLA is also undertaking a major review of the Oil and Gas Production and Conservation Act in collaboration with the provinces, the Canada-Newfoundland Offshore Petroleum Board, government departments and industry to implement, through amendments to legislation, the remaining recommendations on offshore safety made by the Hickman royal commission on the *Ocean Ranger*.

The Government of Canada took a major step in 1987 to improve the long-term prospects for frontier oil and gas development. The Canada-U.S. Free Trade Agreement promises to open new markets to Canadian oil and gas resources. The agreement ensures that U.S. markets will remain open to Canadian energy exports and unimpeded by discriminatory restrictions on the part of either government. This more stable trading environment will enhance investor confidence and ensure that more investment capital will be available to assist in the development of large-scale petroleum projects on the frontier lands.

In my capacity as Minister of Energy I have asked my department to review existing laws and regulations to ensure that they fully take into account environmental considerations. COGLA's ongoing participation in this review process ensures that environmental protection remains a priority in the exploration and development of our frontier petroleum resources.

Industry is responding to the direction provided by this government's energy policies. The world oil price stabilized in 1987, and operators undertook delineation drilling at the sites of major discoveries off the East Coast and north of the 60th parallel. There was also the success of projects such as the delineation of the Panuke oil discovery carried out by Petro-Canada and Nova Scotia Resources (Ventures) Limited. Production testing of the Panuke F-99 well led to the first shipment of oil from the Nova Scotia offshore and confirmed that petroleum can be produced from this region. In the Newfoundland offshore, the successful delineation of the Terra Nova discovery by Petro-Canada signals the possibility of early production from this oil field.

I am looking forward to the year ahead, when the work under way at these sites, and other discoveries on Canada's frontier lands, such as the Amauligak field in the Beaufort Sea, continue to contribute to the Canadian economy and to the prosperity of all Canadians.

Message from the Minister of Indian Affairs and Northern Development, the Honourable Bill McKnight

I am pleased to join my colleague, the Honourable Marcel Masse, Minister of Energy, Mines and Resources, in submitting to Parliament the sixth annual report on the administration of Canada's frontier energy resources.

A cornerstone of this government's Frontier Energy Policy is a commitment to shared management arrangements with Canada's coastal provinces and territories for the management of frontier oil and gas resources. The policy also recognizes the importance of oil and gas to the political evolution of the North. Unlike other frontier jurisdictions, oil and gas areas in the North are on land as well as offshore and most of the area is covered by unsettled land claims.

This government's Political and Economic Framework for the North is a confirmation of our commitment to the political evolution of responsible and independent governments in the North, within the Canadian federation. A cornerstone of the government's policy for the North is a commitment to transfer to territorial governments management and administration for programs which, in the rest of Canada, are provincial responsibilities.

During the past two years, the Department of Indian Affairs and Northern Development has had extensive discussions with territorial governments, northern aboriginal groups and industry to determine how best to apply the Frontier Energy Policy in a way that accommodates the legitimate political aspirations of territorial governments and at the same time provides a predictable and stable political climate necessary to encourage development of the North's energy resources. A northern energy accord, providing for the shared management of northern oil and gas resources, is a priority. We will be working together to create an accord that will be fair to northerners and all Canadians, while seeking to protect the interests of native people.

I was pleased to bring to a successful conclusion the process leading to the first new exploration rights granted in the Mackenzie Valley in more than 15 years. The signing of this unique exploration agreement with Chevron Canada Resources for exploration rights in the Fort Good Hope area, however, should not be considered a precedent for future rights issuances. It is the last exploration agreement considered under the old Canada Oil and Gas Act. Subsequent rights issuance will be governed under the new Canada Petroleum Resources Act.

The Canada Petroleum Resources Act was proclaimed in February, creating a simplified regulatory framework for the northern oil and gas industry. The new act also provides the flexibility to ensure that the North as a whole will benefit from the activities created by the industry.

While the number of exploratory wells drilled in northern frontier lands decreased dramatically from forty in 1986 to six in the past year, with one significant gas discovery in the southern part of the Northwest Territories, the outlook for northern oil and gas exploration and development is decidedly optimistic.

One of the year's most encouraging developments was Gulf Canada's decision to return to the Amauligak structure in the Beaufort Sea for further delineation and testing. The return to Amauligak was made possible by the co-operative efforts of industry, governments and northerners. While the current program has given the local economy a much-needed boost, prospects are exciting and signal a return to optimism in the future of Beaufort Sea exploration and development.

In the High Arctic, Panarctic has expanded its storage facilities by almost half and shipped two tanker loads of oil from its Bent Horn field. Small shipments of oil were dropped off at Resolute and at the Polaris mine to test the feasibility of supplying northern customers directly with northern resources.

I said in my message last year that I was confident that a more favorable climate for northern oil and gas would prevail. The past year has strengthened that confidence. With the policies that this government has put in place, with the free trade agreement with the United States expanding the market for northern energy resources and with increased cooperation between the federal and territorial governments, I believe that we are moving into a more favorable climate for northern oil and gas exploration and development.

There is no question that for the foreseeable future, oil and gas will remain extremely important to the North's economy. We must work together, the federal and territorial governments, the oil and gas industry and northerners, to ensure that oil and gas exploration and development activity is sustained in the North and that it continues for the benefit of all northerners, indeed, of all Canadians.

Bill McKnight

Minister Bill McKnight

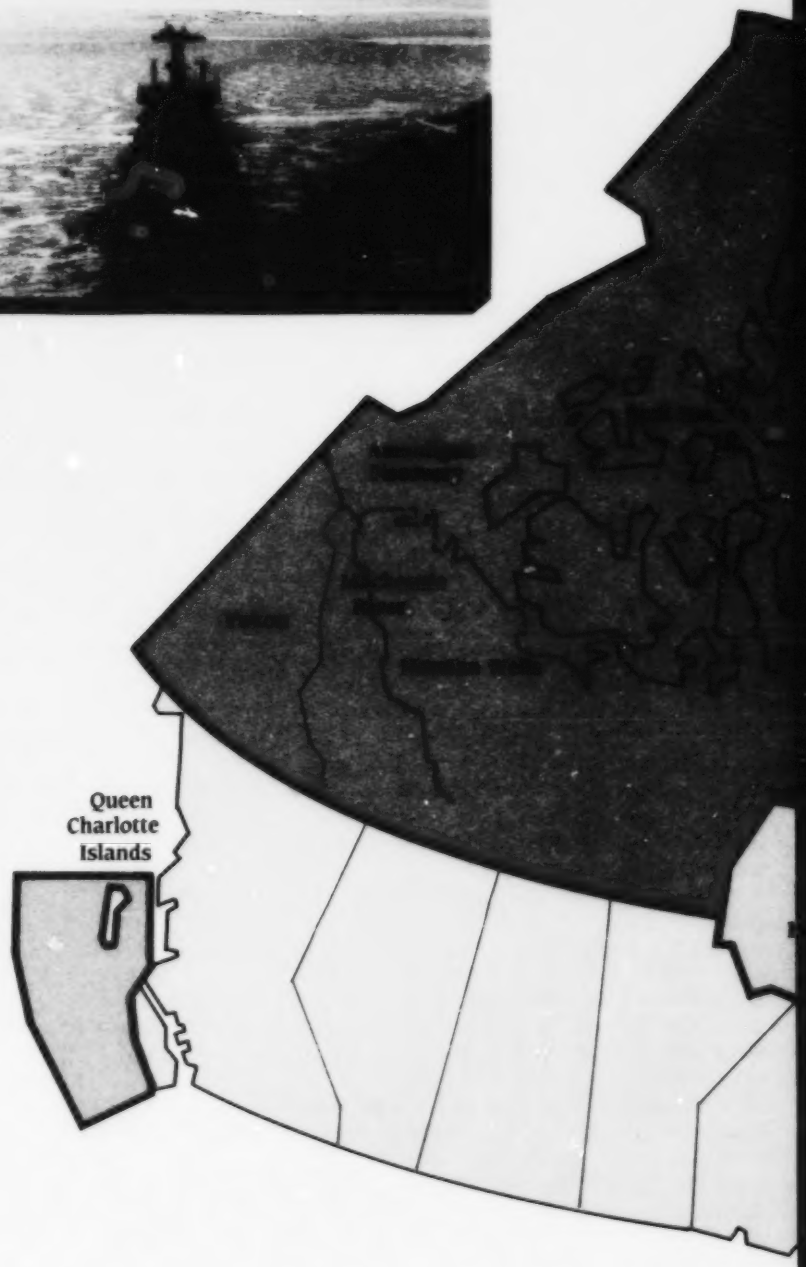
Canada's Frontier Lands

Loading the tanker MV Arctic *at Panarctic's Bent Horn facility.* Courtesy F.R. Engelhardt.

The Molikpaq, *Gulf's mobile arctic caisson, drilling at Amauligak in the Beaufort Sea.*

COGLA geologist participating in a field investigation near Norman Wells. Courtesy T. Bird.

Coastline of South Moresby Island, B.C. Courtesy D. Hardie.



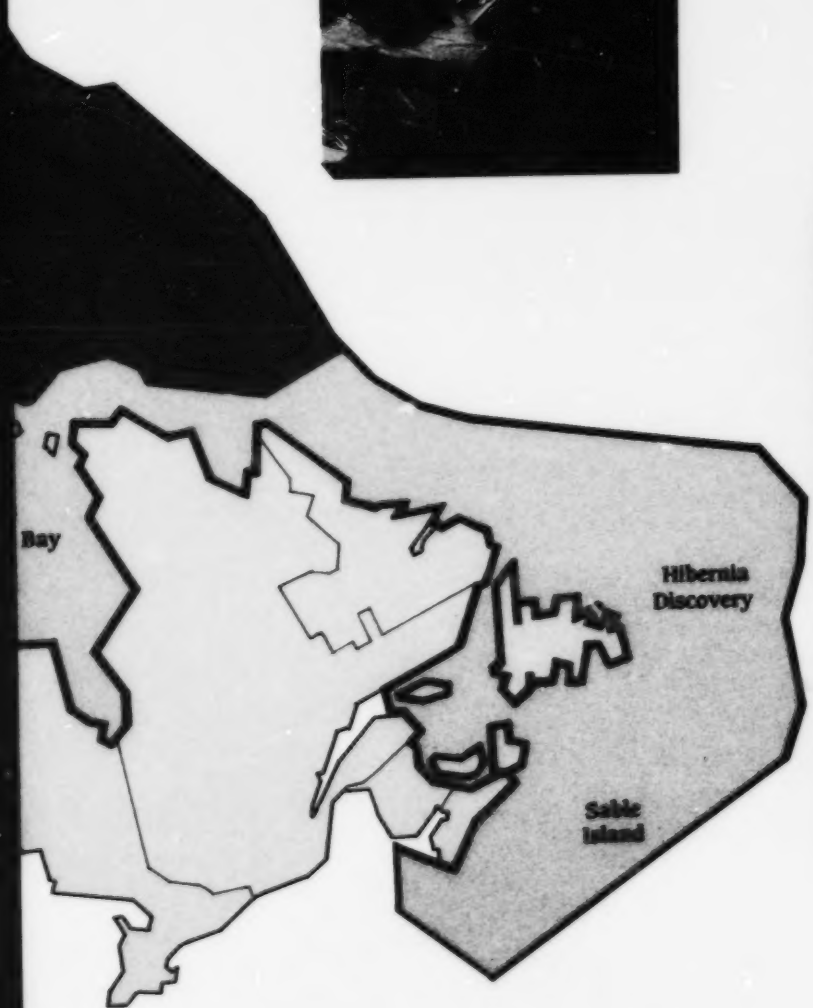
Area administered by the Minister of Energy, Mines and Resources

Area administered by the Minister of Indian Affairs and Northern Development

Recovery of boom during experimental oil spill exercise offshore Newfoundland. Courtesy Canada-Newfoundland Offshore Petroleum Board.

Bow Drill 3 *on location at Husky/Bow Valley et al. Whiterose E-09 on the Grand Banks.* Courtesy Canada-Newfoundland Offshore Petroleum Board.

Loading tanker during Petro-Canada et al. Panuke F-99 test. Courtesy Petro-Canada Resources Inc.



A Word from COGLA's Administrator, Maurice Taschereau

Mr. Maurice Taschereau

A continuing but reduced level of exploration activity took place on Canada's frontier lands in 1987. Uncertain oil prices and the difficulty of predicting the future compelled the industry to concentrate its efforts on delineating existing discoveries. This trend is expected to continue in 1988.

Amauligak is an exciting prospect for future development in the North. COGLA's role is to make the regulatory process as effective as possible, so that oil can be produced from this splendid find in a sound and environmentally safe manner.

There were other encouraging signs during the past year. On the east coast, for example, the Terra Nova and Whiterose oil fields were being delineated and on the Scotian Shelf an extended flow test of the Panuke reservoir resulted in the first shipment of oil from the Nova Scotia offshore. Panarctic continued to develop northern markets for northern oil. Shipments of Bent Horn oil were delivered to Resolute and the Polaris mine to test the feasibility of using the oil directly in the North without first refining it in southern Canada.

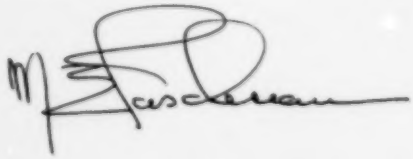
The Canada Petroleum Resources Act (CPRA), proclaimed in February, simplified rights issuance on the frontier lands. The implementing legislation for both the Atlantic and Nova Scotia accords incorporates CPRA. The regulations under the accords are consistent with those applying throughout the rest of Canada's frontier lands. So, although there are separate joint federal-provincial management regimes for oil and gas activity off Canada's east coast, there is a consistent regulatory regime across all frontier areas.

The Canada-Newfoundland Atlantic Accord Implementation Acts were proclaimed by both governments in April. The Canada-Newfoundland Offshore Petroleum Board has in effect been operating for two years; the past year was especially busy. The Canada - Nova Scotia Offshore Petroleum Resources Accord Implementation Acts are expected to be proclaimed in 1988. This will continue the joint management and revenue sharing of petroleum resources off Nova Scotia as well as create a new independent board, the Canada - Nova Scotia Offshore Petroleum Board, to manage activities on behalf of both governments.

Negotiations began in 1987 with the Government of British Columbia on an accord for the Pacific offshore region.

As activity on the frontier lands decreased, COGLA trimmed its staff to the minimum needed to carry out its duties and responsibilities properly. We have used this lean period to put legislation, regulations and guidelines in place. This has proved to be a demanding job requiring close cooperation with, and input from, the provincial and territorial governments, the new boards, other federal departments and industry. Much has been accomplished in 1987 and more remains to be done. We look forward to having a fair, consistent regulatory regime well established as we move into the next phase of exploration and development activity on Canada's frontier lands.

I would like to take this opportunity to express my thanks to the staff of COGLA for their dedication and diligence. I know they will continue to fulfil their duties and responsibilities efficiently and effectively, as they have in the past.



1987 Highlights

A new rights management regime came into effect in February with the enactment of the Canada Petroleum Resources Act. This new legislation repeals and replaces the 1982 Canada Oil and Gas Act and brings into law the government's frontier energy policy announced in 1985. The legislation provides for three new licences (for exploration, significant discovery and production) and modifies the structure of the Environmental Studies Research Funds.

In 1987 COGLA, in concert with other interested federal departments, began the review of the Oil and Gas Production and Conservation Act in light of the recommendations of the Hickman Royal Commission on the *Ocean Ranger*. Proposed amendments to the act will be discussed with the accord provinces and industry prior to consideration by Parliament.

In April, the governments of Newfoundland and Labrador and of Canada simultaneously proclaimed the Canada-Newfoundland Atlantic Accord Implementation Acts. The acts implement the 1985 Atlantic Accord, which provides for joint federal-provincial management and revenue sharing with respect to exploration and development of petroleum resources off Newfoundland and Labrador.

The Nova Scotia legislature passed the Canada - Nova Scotia Offshore Petroleum Resources Accord Implementation Act in May. The federal implementing legislation was tabled in Parliament in June and was before legislative committee at year-end.

In June the Canadian and British Columbia governments released their joint response to the *West Coast Offshore Exploration Environmental Assessment Panel Report*, which opens the door to renewed exploration for oil and gas off the coast of British Columbia. The two governments accepted the intent of most of the panel's 92 recommendations and announced that the federal and provincial moratoriums that have barred exploration in northern waters off the west coast since the early 1970s would be lifted.

Negotiations began between Canada and British Columbia during 1987 toward developing a Canada - British Columbia accord that would establish a joint resource management and revenue-sharing regime for offshore petroleum resources. A northern accord was also being considered to significantly increase the responsibilities of the territorial governments for the management of petroleum resources in the North.

Exploration rights were issued under the old Canada Oil and Gas Act in the Fort Good Hope area. The Minister of Indian Affairs and Northern Development and representatives of Chevron Canada signed the Exploration Agreement, the last to be issued under the previous legislative regime, in Fort Good Hope on November 2. Chevron and the community entered into a joint venture agreement that provides for local participation in the management of exploration activities.

During the year ten exploratory and four delineation wells were drilled on frontier lands, 42 fewer than in 1986. There was one significant gas discovery, the Liard F-25A gas discovery on the mainland of the southern Northwest Territories. Each of the three tested delineation wells was successful, confirming the presence of oil and gas reserves in existing significant discoveries.

Petro-Canada conducted an extended flow test of Panuke F-99, the first delineation well on Shell's 1986 Panuke oil discovery on the Scotian Shelf. The test lasted six days, producing 3700 m^3 of oil, which was shipped by tanker to a refinery in Montreal. This operation marks the first oil shipment from the east coast offshore.

Panarctic continued seasonal production and transport of oil from its Bent Horn development project; there were two oil shipments in August and September. The company sold part of the production to northern markets as a replacement for costly southern diesel oil.

Federal-Provincial-Territorial Management of the Frontier Lands

The COGLA-Inuvialuit Environmental Impact Screening Committee meeting in Inuvik, October 1987. Courtesy W. Greenall.

Joint Management

The federal government manages oil and gas activity on frontier lands jointly with provincial governments in those offshore areas covered by accords, currently the Newfoundland and Labrador and Nova Scotia offshore areas. The provinces have an equal say in the legislation and policies regulating oil and gas activities in their respective offshore areas. The provinces also receive oil and gas revenues from the offshore as if the resources were on land.

The accords with Newfoundland and Nova Scotia each establish an independent offshore board to manage and administer petroleum operations in the offshore area. These boards comprise an independent chairperson and an equal number of federal and provincial appointees. The boards make all decisions on offshore operations. Fundamental decisions, however, are subject to ministerial review.

The implementing legislation for the accords incorporates the Canada Petroleum Resources Act and the Oil and Gas Production and Conservation Act. The regulations promulgated under the implementing legislation correspond to those that apply throughout the balance of Canada's frontier lands. These provisions of the joint management regime ensure consistent regulation of Canada's frontier lands.

Shared management, based on the principle of equality of governments, is a reality in Newfoundland and Nova Scotia. The Government of Canada has a clear commitment to shared management in other frontier areas. A northern accord, which was being considered in 1987, would significantly increase the responsibilities of the governments of the Yukon and the Northwest Territories for the management of petroleum resources. The structure and scope of shared management arrangements are matters for bilateral discussion with the provinces and the territorial governments.

Newfoundland and Labrador

Implementation of the Atlantic Accord

The governments of Newfoundland and Labrador and of Canada simultaneously proclaimed the Canada-Newfoundland Atlantic Accord Implementation Acts on April 4. The acts implement the 1985 Atlantic Accord, which provides for joint management of petroleum exploration and development activities off Newfoundland and Labrador.

Canada-Newfoundland Offshore Petroleum Board

In its first complete fiscal year of operations ending March 31, the board held 11 meetings dealing with land management, geophysical exploration and drilling results in the offshore. At the end of 1987, operators held rights over approximately 2 million hectares under 21 exploration licences. Seventeen significant discovery area declarations had been made. Exploration operations in seven active wells brought more than $382 million in expenditures to the Newfoundland offshore.

The board is developing memorandums of understanding with federal and provincial departments to ensure coordination in the areas of environment, fisheries, benefits and marine safety.

Nova Scotia

The Nova Scotia Accord

The Nova Scotia legislature passed the Canada - Nova Scotia Offshore Petroleum Resources Accord Implementation Act in May. The federal implementing legislation was tabled in Parliament in June, and was under review by legislative committee at the end of 1987. Together, the federal and provincial acts will establish joint management and revenue sharing in petroleum resources off Nova Scotia. The acts will also create a new independent board, the Canada - Nova Scotia Offshore Petroleum Board, to manage offshore petroleum resources for both governments.

Canada - Nova Scotia Offshore Oil and Gas Board

The Canada - Nova Scotia Offshore Oil and Gas Board, established by the 1982 Canada - Nova Scotia Agreement, met six times in 1987.

The recovery of world oil prices from their mid-1986 slump sustained operators' interest in the Nova Scotia offshore. Husky/Bow Valley, Mobil and Shell Canada presented their assessments of the Scotian Shelf to the board.

Texaco Canada kept the board informed of its biophysical and geophysical studies on the Georges Bank and its ongoing consultations with local communities and fishing groups.

The board implemented the federal and provincial governments' benefits policies for petroleum activity and determined how companies should report on the benefits they provide. A set of guidelines for the approval and the reporting of benefits was distributed to companies operating off Nova Scotia.

At the end of 1987, the board reported that operators held rights over approximately 655 331 million hectares under 17 exploration agreements. Twenty significant discovery area declarations had been made.

Yukon Territory and Northwest Territories

COGLA continued to cooperate closely with the Government of the Northwest Territories and the Government of the Yukon Territory in keeping with the spirit of the frontier energy policy of 1985. COGLA also consulted special interest groups on northern oil and gas regulatory issues.

Most of the existing exploration rights in the North matured in 1987, and 38 exploration licences, mostly in the Mackenzie Valley, were renewed for three-year onshore and four-year offshore terms.

Exploration rights were issued in a unique way in the Fort Good Hope area. The exploration agreement was concluded under the old Canada Oil and Gas Act (COGA), which has since been replaced by the Canada Petroleum Resources Act (CPRA). The Minister of Indian Affairs and Northern Development and representatives of Chevron Canada signed the exploration agreement in Fort Good Hope on November 2. Chevron and the community have entered into a joint venture that provides for participation in exploration activities and local benefit opportunities.

COGLA worked closely with the Government of the Northwest Territories in responding to requests from communities for information on frontier energy policy and rights issuance under CPRA. Consultations on new rights issuance with Fort Norman and Arctic Red River continued. Information meetings were also held with the Deh Cho Regional Council.

In the Yukon Territory, COGLA consulted parties interested in a rights issuance in the Whitehorse Basin area. The City of Whitehorse, the Kwanlin Dün Band and two companies remain interested in oil and gas exploration activity. However, the land selection process to settle comprehensive land claims must be completed before exploration rights can be issued in the Whitehorse Basin.

Implementation of the Inuvialuit Final Agreement

In the western Arctic, COGLA met with the Environmental Impact Screening Committee, an Inuvialuit-government advisory body established by the 1984 Inuvialuit Final Agreement. COGLA provided the committee with a summary of the approvals and authorizations issued under the Oil and Gas Production and Conservation Act and CPRA. COGLA undertook to remind operators of the screening provisions of the Inuvialuit Final Agreement.

British Columbia

The Canada - British Columbia Agreement

After the joint federal-provincial response to the *West Coast Offshore Exploration Environmental Assessment Panel Report*, both governments announced that offshore activity could be allowed to proceed provided certain conditions were being met. The federal and provincial moratoriums on exploration in the northern waters off the west coast, which have been imposed since the early 1970s, will be lifted, opening the door to renewed oil and gas exploration off the coast of British Columbia. Discussions of a possible Pacific accord between Canada and the province were under way at year's end.

Rights Management

COGLA issues and manages oil and gas exploration and production rights in Canada's North and certain offshore frontier areas under the authority of the ministers of Indian Affairs and Northern Development, and Energy, Mines and Resources. It also administers federal mineral rights within the provinces on behalf of the Minister of Energy, Mines and Resources.

A new rights management regime came into effect on February 15 with the proclamation of the Canada Petroleum Resources Act (CPRA). The legislation provides for three new forms of licences: exploration, significant discovery and production. Regulations in respect of registration of oil and gas rights, updating the survey system on frontier lands and the imposition and collection of royalties are being developed under CPRA.

During 1987, most of the exploration licences in the North matured and either reverted to Crown reserve or were renewed for three-year terms onshore or four-year terms offshore. An exploration agreement was issued under the Canada Oil and Gas Act (COGA) in the Fort Good Hope area. No new rights were issued under CPRA, which has replaced COGA.

COGLA discussed the development of new forms of licences and cooperated in drafting regulations, policies and guidelines with the Canada-Newfoundland Offshore Petroleum Board, the Newfoundland-Labrador Department of Energy, the Canada - Nova Scotia Offshore Oil and Gas Board and the Nova Scotia Department of Energy. At year-end, COGLA was discussing these issues with industry.

FRONTIER LAND HOLDINGS (at Year-End)	1983	1984	1985	1986	1987
Number of Exploration Licences/Agreements Active*	120	153	150	118	112
Lands Negotiated into Exploration Licences/Agreements (millions of ha)	25.0	21.2	24.9	4.1	7.3
Lands Relinquished or Surrendered (millions of ha)	1.6	24.7	20.0	39.2	15.1
Lands Active* (millions of ha)	115.4	89.5	70.8	33.5	20.6

** Includes declared significant discovery areas.*

LAND STATUS AT YEAR-END, 1987

	Active Exploration Licences/ Agreements*	Lands Relinquished or Surrendered	Lands Negotiated into Exploration Licences/ Agreements	Lands Active	Pending Lands**
			(millions of ha)		
Mainland Territories	29	4.7	4.5	2.3	1.1
Mackenzie Delta and Beaufort Sea	28	1.4	2.1	2.9	0
Arctic Islands and Eastern Arctic Offshore	16	5.9	0.3	1.6	2.4
Hudson Bay	1	0.2	0	11.4	1.4
Grand Banks and Labrador Sea	21	1.8	0.1	1.7	1.5
Nova Scotia Offshore (includes Gulf of St. Lawrence)	17	1.1	0.3	0.7	3.4
West Coast	0	0	0	0	8.7
Total	112	15.1	7.3	20.6	18.5

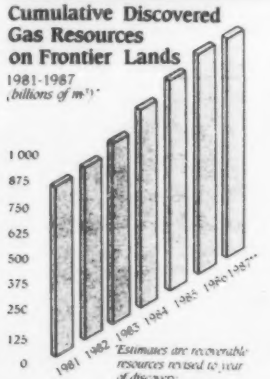
** Includes declared significant discovery areas.*
*** Includes areas where exploration activity has been suspended: west coast, Baffin Bay, Georges Bank, St-Pierre et Miquelon, etc.*

EXPLORATION LICENCES/AGREEMENTS NEGOTIATED IN 1987

Operating Company	Exploration Licence/ Agreement Number	Number of Licences/ Agreements	Area	Location	Term
			(thousands of ha)		(years)
Shell	298, 299	2	202	Scotian Shelf	3
PCI	300	1	9	Scotian Shelf	6
Mobil	301	1	56	Grand Banks	4
PCI	302	1	442	Tweed Lake	3
PCI	303	1	366	Mackenzie Plains	3
Dome	304	1	333	Colville Hills	3
Amoco	305-307	3	278	Southern Territories	3
PCI	308	1	64	Cameron Hills	3
Esso	309	1	318	Lac des Bois	3
Coho	310	1	40	W. Cameron Hills	3
Texaco	311	1	51	Arrowhead	3
Paramount	312	1	32	Cameron Hills	3
Dome	313	1	231	Rond Lake	3
Sulpetro	314	1	95	Trout Lake	3
Wes Dec.	315, 316	2	476	Mackenzie Valley	3
Placid	317	1	175	Beaufort Sea	4
Texaco	318	1	48	Norman Wells	3
Amerada	319	1	104	Fort Norman	3
Chevron	320	1	25	Liard	3
Westmin	321	1	129	Eagle Plain	3
Chevron	322	1	426	Fort Good Hope	8
Panarctic	323-325	3	281	Arctic Islands	4
PCI	326-328	3	960	Southern Territories	3
Dome	329-332	4	1280	Beaufort Sea	4
Amoco	333	1	152	Liard	3
Placid	334	1	326	Beaufort Sea	4
Shell	335	1	156	Mackenzie Delta	3
Gulf	336	1	173	Mackenzie Delta	3
Chevron	337-339	3	69	Mackenzie Delta	3

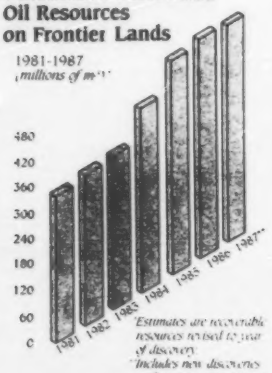
Exploration Activity

Cumulative Discovered Gas Resources on Frontier Lands
1981-1987
*(billions of m³)**



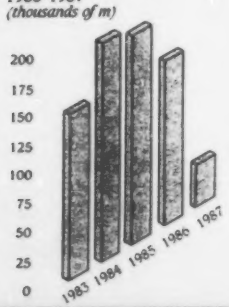
**Estimates are recoverable resources revised to year of discovery.*
***Includes new discoveries and revisions to previous estimates.*

Cumulative Discovered Oil Resources on Frontier Lands
1981-1987
*(millions of m³)**



**Estimates are recoverable resources revised to year of discovery.*
***Includes new discoveries and revisions to previous estimates.*

Exploratory Drilling on Frontier Lands
1983-1987
(thousands of m)



A total of 17 wells were active on frontier lands during the year. Although this number is far below figures for the preceding three years — when there was unusually high activity — it is comparable to levels of activity between previous peaks in the exploration cycle. Fourteen wells were terminated in 1987, six in the North and eight on the east coast offshore. At year-end, one well had been suspended and drilling was under way at two other locations. The proportion of delineation drilling to exploratory drilling increased, indicating industry interest in confirming reserves in known discoveries to prepare for eventual production. All three tested delineation wells were successful. One of the 10 terminated exploration wells, Northcor et al. Liard F-25A in the southern Northwest Territories, was reported to be a significant gas discovery.

The North

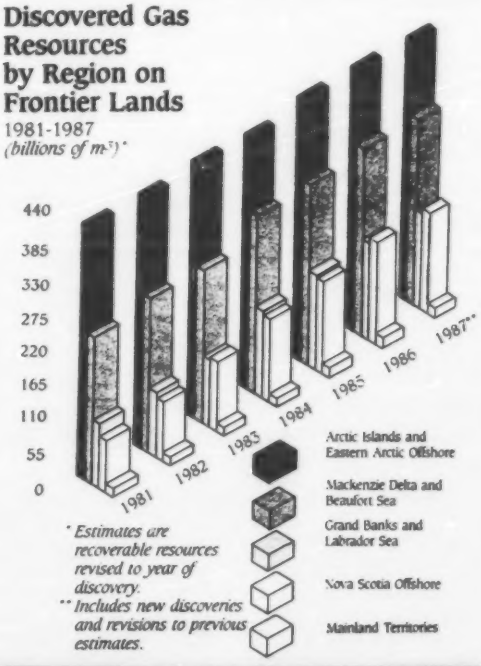
The successful evaluation of the Amauligak oil field, the new significant gas discovery in the southern Northwest Territories, and further evaluation of the Bent Horn oil field highlight northern exploration.

Beaufort Sea

The Beaufort Sea continues to be the most important area for exploration and development in the North. Two delineation and two exploratory offshore wells were active in 1987. Early in the year, Gulf Canada announced its plan to resume delineation drilling on the 1984 Amauligak oil and gas discovery. The drilling of two or possibly three delineation wells is planned for 1987-88 using the *Molikpaq*, a mobile arctic caisson, from a berm on the eastern part of the pool. The first of these, Gulf et al. Amauligak F-24, is the third delineation well within the field. Amauligak F-24 reached total depth and will be tested in the summer of 1988. The second delineation well for 1987-88, Amauligak 2F-24, was spudded in December.

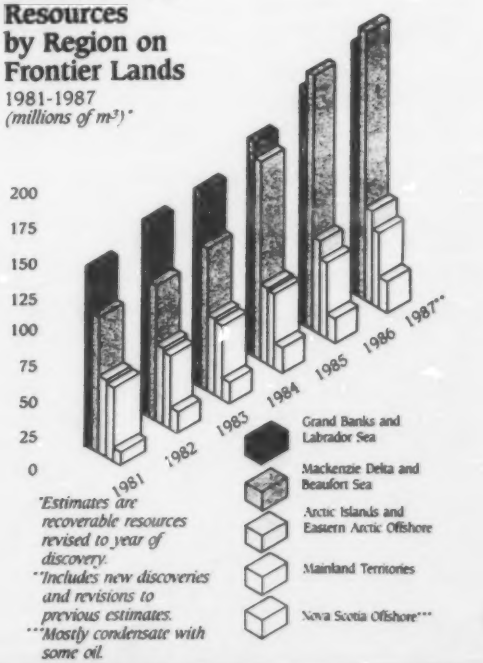
The two exploratory wells yielded disappointing results; both were dry and abandoned. Esso Canada drilled Esso et al. Kaubvik I-43 from an artificial island in the central Beaufort. Trillium et al. Angasak L-03 was drilled from an artificially thickened ice platform off the northern tip of the Tuk Peninsula, marking the first use of this drilling platform in the Beaufort Sea.

Discovered Gas Resources by Region on Frontier Lands
1981-1987
*(billions of m³)**



**Estimates are recoverable resources revised to year of discovery.*
***Includes new discoveries and revisions to previous estimates.*

Discovered Oil Resources by Region on Frontier Lands
1981-1987
*(millions of m³)**



**Estimates are recoverable resources revised to year of discovery.*
***Includes new discoveries and revisions to previous estimates.*
****Mostly condensate with some oil.*

Mainland Territories

Two exploratory wells were terminated, both in the southern Northwest Territories. Northcor et al. Liard F-25A, 10 km northeast of the Pointed Mountain gas field, was tested early in 1987. The well, a follow-up to the Liard F-25 dry hole, had been drilled to total depth in late 1986. Drillstem tests of Liard F-25A flowed gas to the surface at a stabilized rate of 249 000 m^3 per day, establishing a significant gas discovery. Northcor's press release indicated that the company was examining the feasibility of linking the well to the Pointed Mountain gas plant. The second exploratory well, PCI et al. North Cameron C-24, was drilled in the Cameron Hills area in the summer and abandoned without testing.

Arctic Islands

Late in the year, Panarctic drilled an exploratory well, Bent Horn F-72B, to a deeper reservoir section underlying the known Bent Horn oil field. Panarctic was hoping to increase the reserves available for production under the known field and establish a back-up to the current production well, Bent Horn A-02. Bent Horn F-72B was drilled from the well bore of the 1975 Bent Horn F-72A, and reached a total depth of 3278 m. Panarctic abandoned the well without testing.

East Coast Offshore

Drilling activity in the east coast offshore was concentrated in the traditionally active areas, near Sable Island off Nova Scotia and near Hibernia off Newfoundland. Three successful delineation wells, one off Nova Scotia and two off Newfoundland, highlight 1987 activity.

Nova Scotia Offshore

Three wells were terminated off Nova Scotia, one delineation and two exploratory. Petro-Canada drilled a successful delineation well, PCI et al. Panuke F-99, on Shell's 1986 Panuke oil discovery. Oil flowed on drillstem tests at rates up to 918 m^3 per day. To evaluate reservoir quality and production capability, an extended flow test was conducted over a six-day period. The test produced about 3700 m^3 of oil into a tanker. The oil was transported to a refinery in Montreal, the first time that oil has been shipped from the east coast offshore.

Both exploratory wells were dry and abandoned. Petro-Canada drilled PCI et al. Como P-21, 17 km west of the Cohasset oil discovery, hoping for another oil discovery in the Cohasset-Panuke oil field. Canterra et al. Whycocomagh N-90, drilled to 3536 m at a location between earlier significant gas discoveries at Glenelg and Alma, was abandoned without testing.

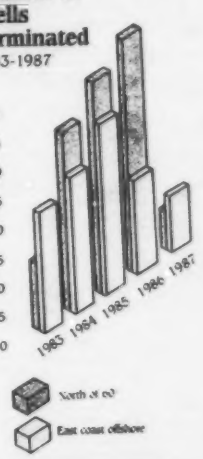
Newfoundland Offshore

The Newfoundland offshore was the most active area on the frontier lands, with four delineation wells and three exploratory wells. Two operators reported successful delineation drilling. In late 1987, Petro-Canada began a delineation drilling program at Terra Nova to further evaluate the extent of the oil pool. Petro-Canada et al. Terra Nova H-99, the fifth delineation well at Terra Nova, was tested. It flowed oil at 1192 m^3 per day, confirming the existence of a good-quality, productive reservoir section in the northeastern quadrant of the structure. The sixth delineation well, Terra Nova C-09, was spudded in early December immediately north of the Terra Nova discovery well.

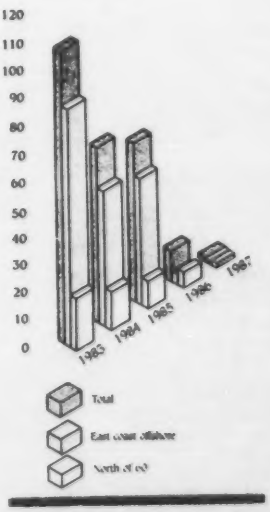
Husky/Bow Valley reentered HBV et al. North Ben Nevis P-93, the first delineation well on their 1986 discovery of gas and oil. Two drillstem tests conducted over separate intervals flowed oil at 864 m^3 per day and gas at 110 000 m^3 per day. Husky/Bow Valley later continued delineation drilling at the Whiterose gas and oil discovery. The fourth delineation well, HBV et al. Whiterose E-09, was drilled to 3811 m before it was temporarily suspended late in the year for repairs and certification surveys on the *Bow Drill 3* drilling unit.

Exploration drilling included three unsuccessful exploratory wells. Husky/Bow Valley drilled two exploratory wells, HBV et al. Golconda C-64 and HBV et al. Bonne Bay C-73, and abandoned both without testing. Northcor and partners undertook the only drilling outside the Hibernia area at Northcor et al. Narwhal F-99 on the continental slope. Narwhal F-99 was drilled in 1574 m of water, the deepest water for any offshore Newfoundland well to date. After it was drilled to 4575 m, the well was abandoned without testing.

Number of Wells Terminated
1983-1987

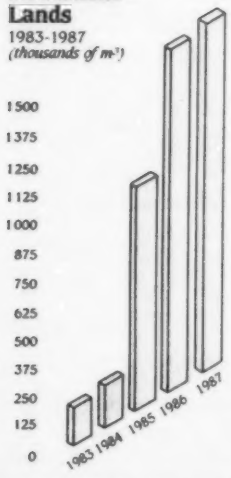


Reflection Seismic Shot on Frontier Lands
1983-1987
(thousands of km)

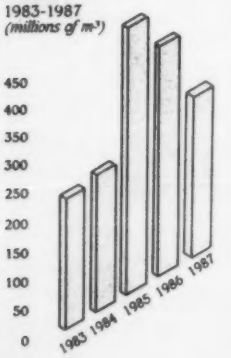


Conservation and Development

Oil Production on Frontier Lands
1983-1987
(thousands of m³)



Gas Production on Frontier Lands
1983-1987
(millions of m³)



COGLA is responsible for regulating the development and production of oil and gas on frontier lands, while ensuring effective conservation of these valuable, nonrenewable resources.

Norman Wells, Mainland Territories

COGLA analyzed the production data and performance of the Norman Wells field to ensure that Esso had met the terms and conditions established in 1980 when the site's waterflood expansion program was approved. The analysis confirmed that the program had succeeded: oil production flow rates had stabilized, the gas-oil ratio had decreased and the reservoir pressure had increased.

Production from the Norman Wells field in 1987 totaled 1 531 000 m³ of oil, an increase from 1 411 000 m³ in 1986. The daily average oil rate of 4165 m³ per day peaked in December at 4860 m³ per day. Consequently, gas production in 1987 decreased to 163 000 000 m³. The average gas-oil ratio continued a downward trend and decreased to 100, compared with 133 in 1986.

Additional drilling increased the active well count to 168 producers and 146 injectors. Additional wells not only increased the recoverable reserves, but also improved waterflood efficiency by improving the producer-injector ratio. Esso upgraded existing processing facilities to ease the handling of larger volumes of produced water and the processing of gas.

Pointed Mountain, Mainland Territories

Gas production from the Pointed Mountain gas field continued to decline in 1987. The field produced 156 000 000 m³ compared with 205 000 000 m³ in 1986. Cumulative gas production to year-end totaled 7 831 000 000 m³.

Amauligak, Beaufort Sea

COGLA finished examining the data from the 1986 extended flow test on the Amauligak I-65B well. Based on these analyses, guidelines were developed for the running of future extended flow tests.

A delineation program at the Amauligak F-24 site, on the east side of the Amauligak structure, was approved. Data gathered from this drilling and testing program will be incorporated into a reservoir description for a reservoir simulation study, which will help evaluate production alternatives for the field.

Bent Horn, Arctic Islands

The Bent Horn storage facilities were expanded in 1987 by about half, from 17 161 m³ to 25 551 m³. For the third consecutive year, Panarctic shipped oil to southern markets — two tanker loads. The first shipment began loading August 26 and 23 930 m³ of oil was transferred to the MV *Arctic*. En route to Montreal, the vessel transferred 1930 m³ at Resolute for the Northern Canada Power Commission. The MV *Arctic* returned to the Bent Horn site on September 15 and a second shipment, 18 689 m³ of oil, was transferred to the vessel. The ship proceeded to Little Cornwallis Island and delivered 5403 m³ of oil at the Polaris mine. The rest of the oil was transferred near Devon Island to the *Irving Nordic*, for delivery to the Petro-Canada refinery in Montreal.

Bent Horn more than doubled its 1986 production. The well produced 34 523 m³ of oil in 1987, compared with 17 522 m³ in 1986. Cumulative oil production to year-end was 81 539 m³.

Hibernia, Newfoundland Offshore

To address conservation issues raised in Mobil's Hibernia Development Plan Application (HDPA), COGLA conducted a detailed geological and engineering study of the Avalon and Hibernia sandstone reservoirs. A computerized reservoir description system generated net pay, porosity and permeability data for both reservoirs. Several two-dimensional, multilayered, cross-sectional models were used to produce the data needed to create the three-dimensional models.

For the Avalon sandstone, COGLA conducted waterflooding studies for the HDPA and surrounding areas. Testing at the Hibernia B-08 well suggested a naturally occurring miscible bank in the Hibernia sandstone. This prompted evaluation of both waterflood and miscible flood three-dimensional models for the Hibernia sandstone. The gas flood model achieved miscibility, and preliminary results from the calculations were encouraging. The study developed oil rate predictions and estimates of oil recovery for both the Avalon and Hibernia reservoirs.

Terra Nova Oil Field, Newfoundland Offshore

Petro-Canada initiated a delineation drilling program to confirm the presence of additional oil reserves in the Terra Nova structure. The PCI et al. Terra Nova H-99 well, the fifth delineation well for the structure, flowed oil and confirmed the existence of a good-quality production reservoir section in the structure. The sixth delineation well was being drilled at year-end. When the delineation program is completed, Petro-Canada is expected to file a development plan application, using a floating production system, with the Canada-Newfoundland Offshore Petroleum Board. COGLA is currently reviewing the oil reserve estimate for Terra Nova.

Venture, Nova Scotia Offshore

COGLA completed a study to develop an optimal depletion strategy for a high-pressure, multi-sand reservoir, such as that found in the Venture field. This study evaluated the complications associated with balancing the tasks of maximizing the gas flow rate, obtaining reservoir engineering data and maximizing resource conservation. The results were published in the Venture Gas Field Depletion Study.

Cohasset Oil Field, Nova Scotia Offshore

Based on the results of PCI et al. Cohasset A-52, the second delineation well on the Cohasset structure, additional reservoir engineering evaluations were conducted to determine reserve estimates. In anticipation of future development, Petro-Canada began looking at production alternatives and facilities design for the field.

Panuke Oil Field, Nova Scotia Offshore

A delineation well, PCI et al. Panuke F-99, confirmed the oil zone found in the discovery well Panuke B-90. Petro-Canada tested the Panuke F-99 well for six days and produced about 3700 m^3 of oil at rates up to 918 m^3 per day. The company is conducting conceptual studies on production alternatives.

Panarctic's Bent Horn facility on Cameron Island in the High Arctic. Courtesy K. Singh.

The MV Arctic *loading crude oil at the Bent Horn production site.* Courtesy F.R. Engelhardt.

Protection of the Worker

Safety drill: man overboard wearing a survival suit.

Regulations and Guidelines

Since its inception in 1981, COGLA has been responsible for ensuring, through the Oil and Gas Production and Conservation Act, the health and safety of petroleum workers on frontier lands. COGLA has been consulting with the Newfoundland and Nova Scotia governments and with the Canada-Newfoundland Offshore Petroleum Board on all regulatory initiatives concerned with health and safety of petroleum workers.

To enhance the safety of every work site, COGLA collaborated with Labour Canada to develop the Canada Oil and Gas Occupational Safety and Health Regulations, promulgated at the end of October under Part IV of the Canada Labour Code. Under a memorandum of understanding with Labour Canada, COGLA is responsible for applying Part IV of the code to personnel employed in the exploration, production, processing, conservation or transportation of oil and gas on frontier lands. The new regulations set out specific minimum standards for the work site including lighting, noise levels, material-handling equipment, sanitation and drinking water quality.

COGLA, in cooperation with the provinces of Nova Scotia and Newfoundland, is continuing its revision of the technical aspects of the Canada Oil and Gas Drilling Regulations. The revisions will take into account advances in drilling technology and procedures, as well as the necessary amendments to conform with Part IV of the Labour Code. COGLA will be consulting with the industry once the amended regulations are drafted.

COGLA continued drafting the Canada Oil and Gas Production Installations Regulations. As part of developing appropriate and effective standards for these regulations, COGLA reviewed present practices in selected areas of production. The results formed the basis of five reference manuals for providing safe working practices at production sites. The latest draft of the regulations have been sent to industry for review and comment.

During the past year COGLA introduced a scheme for a certificate of fitness for production structures. Guidelines for qualifying an organization as a certifying authority were compiled. Other guidelines describing the duties of a certifying authority when assessing production installations were also formulated.

Standards for Survival Suit Systems

By regulation, helicopter crew members and passengers must wear immersion suits when a helicopter supporting a drilling unit offshore is traveling over water. In December 1986, the Canadian General Standards Board published the Helicopter Passenger Transportation Suit Systems standard. COGLA chaired the committee involved in the drafting of this standard. The standard describes the detailed design and performance requirements for immersion suits to be used in Canada's frontier areas. All operators must comply with this standard by July 1988.

COGLA is also significantly involved in developing standards for marine abandonment and working suits. These standards are almost complete and suits meeting the standards will likely be on the market before the end of 1988.

Canadian Standards Association Offshore Code

COGLA serves on the Canadian Standards Association (CSA) steering and technical committees that are developing a code for the design, construction and installation of fixed offshore production structures. Preliminary standards for design criteria and loads, foundations, steel structures, concrete structures and sea operations will be published in 1988. COGLA and CSA have also begun reviewing and verifying the code's technical and practical aspects.

Geopressure Drilling Task Force

The Geopressure Drilling Task Force (GDTF) reported on its major areas of investigation, including pressure prediction, pressure detection, tubular design, and well-control equipment and procedures. The report recommended practices to promote safety among operators drilling in geopressured formations. The task force, a joint COGLA-industry effort, was formed in 1986 to respond to the concerns in the COGLA-commissioned report, *An Examination of Safety Procedures and Practices Used in Exploratory Drilling Operations Conducted in Abnormally Pressured Formations in the Scotian Shelf Area*. The GDTF report will be recommended to all operators drilling in geopressured areas.

Safety Training

COGLA serves on a technical committee that is developing a training program to protect petroleum workers from hydrogen sulphide gas. The committee includes provincial governments, the Petroleum Industry Training Service, the Canadian Association of Oilwell Drilling Contractors and other industry associations. Training will be mandatory for oil field workers who may encounter this extremely toxic gas during their duties.

This year COGLA developed survival training guidelines for the east coast and the North. On the east coast, these guidelines were aimed primarily at workers who have been temporarily absent from the offshore and need retraining. In the North, similar guidelines are mainly for workers who need basic marine safety training.

Inspections

COGLA carries out on-site inspections during the course of a drilling or production program to assess the safety and effectiveness of the operation and to ensure compliance with regulations and guidelines. In 1987, COGLA conducted 50 inspections.

In 1987, under a Memorandum of Understanding between COGLA and Labour Canada, COGLA inspectors were appointed safety officers. As a result, they are responsible for the monitoring of safety and health in the work place and the enforcement of Part IV of the Canada Labour Code where frontier oil and gas activities are carried out.

Lost-Time Accidents

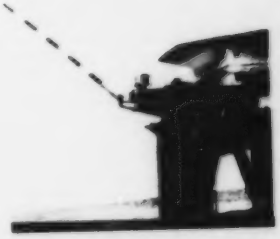
The accident rate for drilling operations, calculated as the number of lost-time accidents (LTAs) per million person-hours worked, decreased significantly in 1987 to 9.7 (compared with 22.4 in 1986). In addition to the LTAs listed in the accompanying table, six others were reported on the frontier lands in production-related activities. There were no fatalities associated with oil and gas exploration or production in 1987.

Sea Ice and Icebergs

Only one drilling rig operated on the Grand Banks during the 1986-87 ice season. Husky/Bow Valley's *Bow Drill 3* was drilling at Bonne Bay C-73 on February 25 when pack ice encroached. Once it became apparent that the ice was going to stay, the drilling unit left for Mortier Bay for annual inspection and repairs. Later in the season, several icebergs moved southward over the Grand Banks; few approached the drilling site, however, and only one had to be towed.

For the second consecutive year, ice conditions in the Beaufort Sea were favorable. There was more open water than usual and the open-water season lasted longer. During the year there were fewer than normal concentrations of multiyear ice, which frequently impedes drilling operations.

Gulf took advantage of the longer than usual open-water season that existed after mid-July to complete berm construction and set down the *Molikpaq* at the Amauligak F-24 site in September.



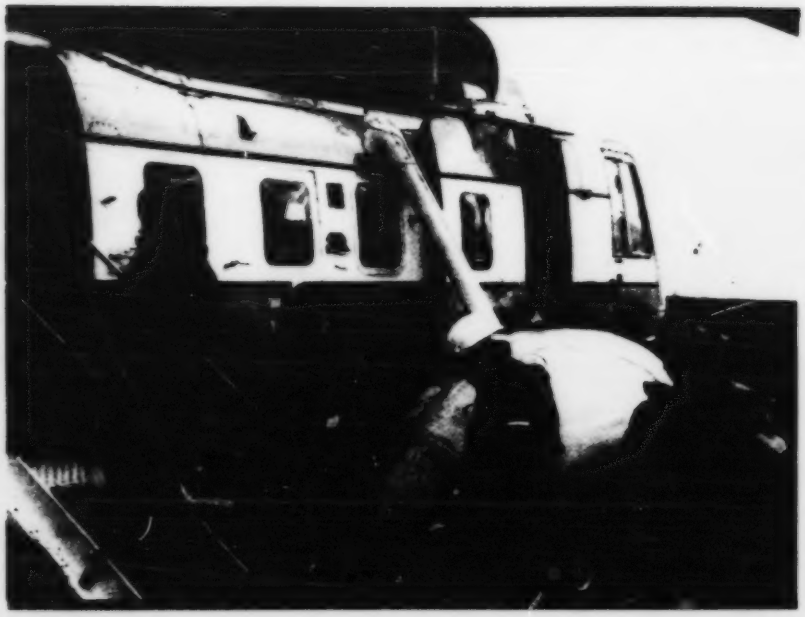
Husky/Bow Valley's Bow Drill 3 *showing the Preferred Orientation and Displacement (PROD) device (boom at left).* Courtesy Canada-Newfoundland Offshore Petroleum Board.

LOST-TIME ACCIDENTS ON FRONTIER LANDS, 1987

	Person-Hours at Work Site		Lost-Time Accidents		Accident Rate	
	Drilling Unit	Standby/ Supply Vessel	Drilling Unit	Standby/ Supply Vessel	Drilling Unit	Standby/ Supply Vessel
					(LTA/millions of person-hours)	
Mainland Territories	228 720	N/A	0	N/A	0	N/A
Mackenzie Delta and Beaufort Sea	605 139	245 028	6	6	9.9	24.5
Arctic Islands and Eastern Arctic Offshore	42 000*	N/A	1	N/A	23.8	N/A
Grand Banks and Labrador Sea	533 560	205 155	8	19	15.0	92.6
Nova Scotia Offshore	133 450	41 754	0	0	0	0
Total	1 542 869	491 937	15	25		

**Estimated.*
N/A – Not applicable.

Protection of the Worker



COGLA personnel traveling offshore wearing approved survival suits. Courtesy M. Thomas.

Research and Development

Canadian environmental conditions often demand that new technologies be developed, assessed and implemented or that established technologies be adapted to unique circumstances. Research and development (R&D) is an integral component of COGLA's activities.

The Program for Energy Research and Development (PERD) of the Department of Energy, Mines and Resources helps to ensure that the federal government has the technical knowledge to fulfil its regulatory responsibilities for the production of crude oil, natural gas and electricity efficiently and safely.

COGLA administered several major R&D projects under PERD in 1987, chaired the Marine Engineering Committee, and served on the geoscientific, offshore geotechnics, materials, transportation and environment committees. Research studies and projects were initiated in rig evacuation, improved emergency equipment and sea rescue techniques, standards for the design, construction and installation of offshore structures, protection of pipelines, and ice-structure interaction. Some of these important studies are described below.

Preferred Orientation and Displacement Lifeboat Launching System

The Preferred Orientation and Displacement (PROD) system is designed to direct a lifeboat safely away from a drilling unit as the craft is being launched. Following successful testing, the system was approved in 1987 as supplementary lifesaving equipment on semisubmersible mobile offshore drilling units. Two PROD units were installed on the *Bow Drill 3* operating off Canada's east coast. Watercraft International, the company that developed the PROD system, has since carried out further trials to adapt the system to fixed production platforms in the North Sea.

Lifeboat Occupant Recovery System

The Lifeboat Occupant Recovery System (LORS), conceived by Husky/Bow Valley, was under development in 1987. It evolved from the PROD system evaluation, which recognized that an evacuation is not complete until survivors are safely removed from the lifeboat. LORS is designed to ensure safe transfer of lifeboat occupants to a recovery vessel.

A hinged and floating boom installed on the recovery vessel is arranged to allow the recovery of the lifeboat. Once the lifeboat is secured to the boom, the lifeboat occupants can be transferred to the vessel by such methods as inflatable ramps, rescue baskets or individual rescue harnesses.

The project was financially and technically supported by COGLA through PERD, and by the Newfoundland and Nova Scotia governments. The U.K. Department of Energy also financed parts of the program.

Personnel Transfer Basket

This joint government-industry project developed a safer method for transferring people from a drilling unit to a recovery vessel. In severe weather, transferring workers by crane-basket can be hazardous and time-consuming. The improved Personnel Transfer Basket (PTB) prototype reduces evacuation time and offers more protection to passengers with its improved shock-absorbing features. Industry will continue to develop and market the PTB.

Seismic Hazard Maps for Canada's Frontier Regions

The safe design and operation of offshore structures must consider the risk of seismic activity. COGLA, under funding from PERD, oversaw the production of a series of seismic hazard maps for eastern Canadian offshore regions and the initiation of work on maps for the Beaufort Sea and Arctic regions. When complete, the maps will become part of the database that will be used to develop new Canadian standards for the design, construction and installation of fixed offshore structures.

Design of Arctic Offshore Installations and Pipelines

COGLA has been playing a leading role in the development of analytical methods for the design of arctic installations such as caisson-type structures, artificial islands and arctic offshore pipelines. In 1987 COGLA cochaired an international workshop on geotechnical modeling. The results of this workshop have been instrumental in directing further research in North America.

COGLA initiated a research program that will bring together geotechnical and coastal engineering in the analysis of wave-seabed interaction. The goal is to improve physical and numerical modeling techniques for a better understanding of hydraulic erosion and settlement problems around shallow water gravity structures.

COGLA is the major partner in a joint industry project initiated this year to look at local ice loads and ice-structure interaction at the Amauligak F-24 site. COGLA also engaged a consortium of companies to look at the criteria for protecting arctic offshore pipelines from ice scour.

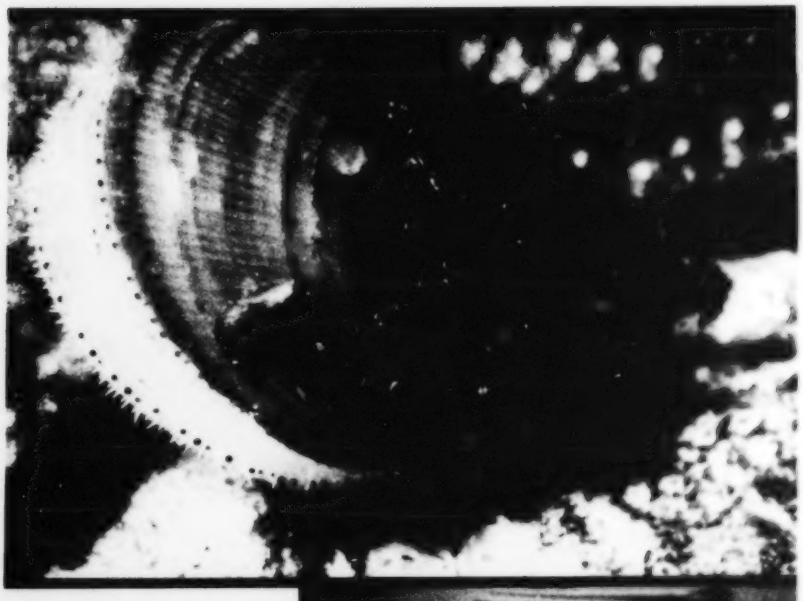
Environmental Design Criteria

A government-industry working group is preparing an extensive climatology of east coast waves. The project team includes representatives from the Atmospheric Environment Service (AES), and the federal departments of National Defence, Fisheries and Oceans, and Transport, as well as COGLA and Mobil. The program will provide operational experience using wave models, a seven-year archive of wave data, and a detailed record of the 50 most extreme storms on the Grand Banks and the Scotian Shelf.

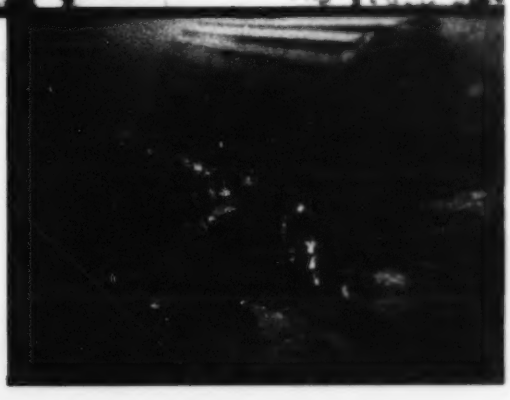
On-site inspection of Panarctic's Bent Horn well site facilities, the northernmost producing well in Canada. Courtesy D. Dempster.

With the resumption of activity at Amauligak, the need for information about Beaufort Sea winds, waves and currents became critical. A government program of the Marine Environmental Data Service and the Institute of Ocean Sciences (both of Fisheries and Oceans), the Canadian Climate Centre (part of AES) and COGLA is establishing a storm climatology for the southern Beaufort Sea that will be useful for current and future developments in the area. This climatology will contain information on the winds, waves, and surface and bottom currents for the 20 largest storms since 1977. It will be complete in 1989.

Protection of the Environment



The scallop: a key species on Georges Bank. Courtesy Department of Fisheries and Oceans.



Lobster (Homarus Americanus) *on the east coast.* Courtesy Department of Fisheries and Oceans.

On the East Coast

Georges Bank

COGLA continued updating and assessing environmental information on Texaco's proposal to start exploration on Georges Bank, including the screening statement prepared in 1986 by the Canada - Nova Scotia Offshore Oil and Gas Board. Texaco has launched several environmental studies related to its proposed drilling program. These include laboratory toxicity and tainting studies, surveys for scallops and lobsters in the area around the proposed drill sites, and modeling studies to predict the off-site movement of operations-related fluids. Texaco intends to include this material in its public information and consultation program.

Texaco visited the fishing communities of southwest Nova Scotia to explain its exploration proposal. This consultation effort, begun in 1986, involved the establishment of information centres in three Nova Scotia communities (Yarmouth, Barrington Passage and Lunenburg), a series of meetings with municipal councils throughout the province, and many small, informal group discussions with fishermen and fish plant operators.

On the West Coast

Environmental Review

In June the federal and British Columbia governments released the joint government response to the *West Coast Offshore Exploration Environmental Assessment Panel Report*. COGLA played a major role in coordinating the federal response and preparing the document. The two governments accepted the intent of most of the panel's 92 recommendations, including the establishment of an environmental coordinating committee to provide expert advice on the possible environmental effects of proposed offshore exploration north of Vancouver Island. The committee will hold its first meeting in January to identify research needs.

In November, COGLA and the B.C. Ministry of Energy, Mines and Petroleum Resources participated in a consultation program in B.C. coastal communities and in the Queen Charlotte Islands. The program responded to the federal and provincial ministers' determination to work closely with B.C. residents to ensure that when the moratoriums are lifted, exploration will not disrupt the environment or the use of environmental resources.

In the North

Amauligak

Early in the year, Gulf indicated its intention to conduct delineation drilling and an extended production testing project at the Amauligak site. Gulf submitted a project description to the Environmental Impact Screening Committee, a joint government-Inuvialuit body created under the Inuvialuit Final Agreement. After completing its screening, the committee referred the proposed project to the Regional Environmental Review Committee (RERC) of Indian and Northern Affairs Canada. COGLA and RERC drafted guidelines for Gulf's preparation of a project plan for environmental protection and RERC recommended that the project proceed under certain conditions.

COGLA, RERC and Gulf developed a compensation program for the Inuvialuit covering potential wildlife harvest damages that might result from activities related to the Amauligak project.

Bent Horn

COGLA and other government agencies reviewed and approved Panarctic's plan to expand the capacity of the bermed oil storage area at the Bent Horn site. COGLA staff inspected the site to ensure that the company complied with its environmental protection plan. Staff also oversaw loading of the MV *Arctic* with this year's two oil shipments.

Consultations

Guidelines

COGLA, other government departments, the oil and gas boards, and industry continued preparing the offshore hydrocarbon drilling and production waste treatment guidelines pursuant to regulations.

Further consultations were held with the oil industry to develop guidelines for the environmental monitoring of oil spills. Guidelines dealing with well site surveys, meteorological, oceanographic and ice programs, contingency planning, the use of explosives and oil-based drilling muds continue to be evaluated and updated. Also, a newly formed government-industry task force began examining the environmental, engineering and regulatory problems associated with using diesel oil as a drilling fluid lubricant.

Memorandums of Understanding

In 1987 COGLA signed two memorandums of understanding to ensure the protection of the fisheries and the provision of environmental and ocean-related services in the Newfoundland offshore. The other signatories were: the Canada-Newfoundland Offshore Petroleum Board; the Newfoundland and Labrador Intergovernmental Affairs Secretariat and departments of Energy and Environment; and the federal departments of Environment and Fisheries and Oceans. These memorandums describe the guiding principles and consultative process to be followed.

Environmental Assessment

COGLA continued to be an active member of the Interdepartmental Committee on Environmental Assessment of the Federal Environmental Assessment Review Office. COGLA also served on several technical subcommittees evaluating environmental impact assessment methodologies, techniques, processes and procedures for activities on Canada's frontier lands.

Field experiments to determine the behavior of oil in pack ice in the Cabot Strait, N.S. Courtesy S.L. Ross Environmental Research Ltd.

Environmental Studies Research Funds

The Environmental Studies Research Funds (ESRF) support environmental and social research related to oil and gas exploration and development on frontier lands. The program, administered by COGLA, is funded through a levy on oil and gas companies holding interests on frontier lands.

The Canada Petroleum Resources Act (CPRA), proclaimed early in the year, modified the ESRF structure. The name of the program changed from Environmental Studies Revolving Funds to Environmental Studies Research Funds and a new management board replaced the original two advisory boards. ESRF regional regulations, which form the basis for levy calculations, were promulgated under CPRA.

No levies were collected in 1987 nor were any new studies initiated. A number of studies begun in previous years were completed and the results published and distributed through the ESRF technical report series. Almost one third of the more than 80 titles in the series were published in 1987. Some recently published reports include:

- *Local Business Adaptation to East Coast Offshore Energy Development*. This report presents guidelines to help local businesses deal more successfully with the oil industry. It is based on information obtained from the oil industry and local businesses experienced in obtaining and supplying goods and services for offshore oil and gas activities.

Protection of the Environment

Environmental conditions during experimental oil spill offshore Nova Scotia. Courtesy S.L. Ross Environmental Research Ltd.

- *Ice Scour Data Base for the Beaufort Sea.* This study provides designers of underwater facilities with a data base on more than 3500 ice scours in the Beaufort Sea. The data were obtained from industry and government records and each scour is described in a 27-column data base. This allows flexibility in data manipulation for deriving design criteria for safe installation of underwater petroleum facilities in the Beaufort Sea.
- *Monitoring the Long-Term Fate and Effects of Spilled Oil in an Arctic Marine Subtidal Environment.* This study, a follow-up to the 1981 Baffin Island Oil Spill experiment, examined the fate and biological effects of the spilled hydrocarbons four years later. The research showed that although hydrocarbon traces could still be found in the environment and some life forms had increased oil concentrations, few marine organisms had died and the underwater ecosystem had not changed significantly.
- *Field Research Spills to Investigate the Physical and Chemical Fate of Oil in Pack Ice.* Three small experimental oil spills were made in moderately and densely packed ice conditions off Cape Breton Island. The study found that these ice conditions effectively confine the oil and facilitate on-site burning. These observations will be useful in calibrating oil spill models and in planning more effective countermeasures.
- *The Use of Chemical Dispersants in Salt Marshes.* This study examined the effects of oil on typical tidal marsh vegetation and compared it with the combined effects of oil and a chemical dispersant used to counter oil spills. Findings revealed that the dispersant not only was ineffective in removing oil from vegetation, but also was more toxic to the plants than oil alone.

Northern Land Use Planning

In the Northwest Territories, COGLA participated in workshops held by the Lancaster Sound Regional Land Use Planning Commission in Resolute and Pond Inlet. A COGLA official chaired a working group on oil and gas that produced background material for the commission to help prepare a draft land use plan for the area. COGLA also offered suggestions to the commission following release of a discussion paper outlining proposals for a draft land use plan in October.

Employment and Industrial Benefits

Northern Developments

The most significant event in the Beaufort Sea during 1987 was Gulf's decision to return to Amauligak for further delineation drilling and testing. This gave a much needed boost to the local economy, which had been directly affected by the recent downturn in northern oil and gas activities. COGLA and the territorial government departments responsible for northern benefits met frequently with the operator to discuss the Canadian and northern benefits aspects of Gulf's extended formation testing program for Amauligak.

Farther north, Panarctic expanded its operations at Bent Horn, shipping two tanker loads of crude petroleum and drilling an exploratory well in the hope of increasing the project reserve base. The company negotiated the sale of part of its crude production as a replacement for costly southern diesel oil for use at Resolute by the Northern Canada Power Commission and at the Polaris mine by Cominco.

The new rights issuance to Chevron in the Mackenzie Valley resulted in a joint venture agreement between Chevron and the community of Fort Good Hope. This agreement should lead to increased employment opportunities for Fort Good Hope residents.

In the Mackenzie Valley, Esso continued its infill drilling program at Norman Wells, using the native-owned Shehtah Drilling to drill 33 additional wells during 1987.

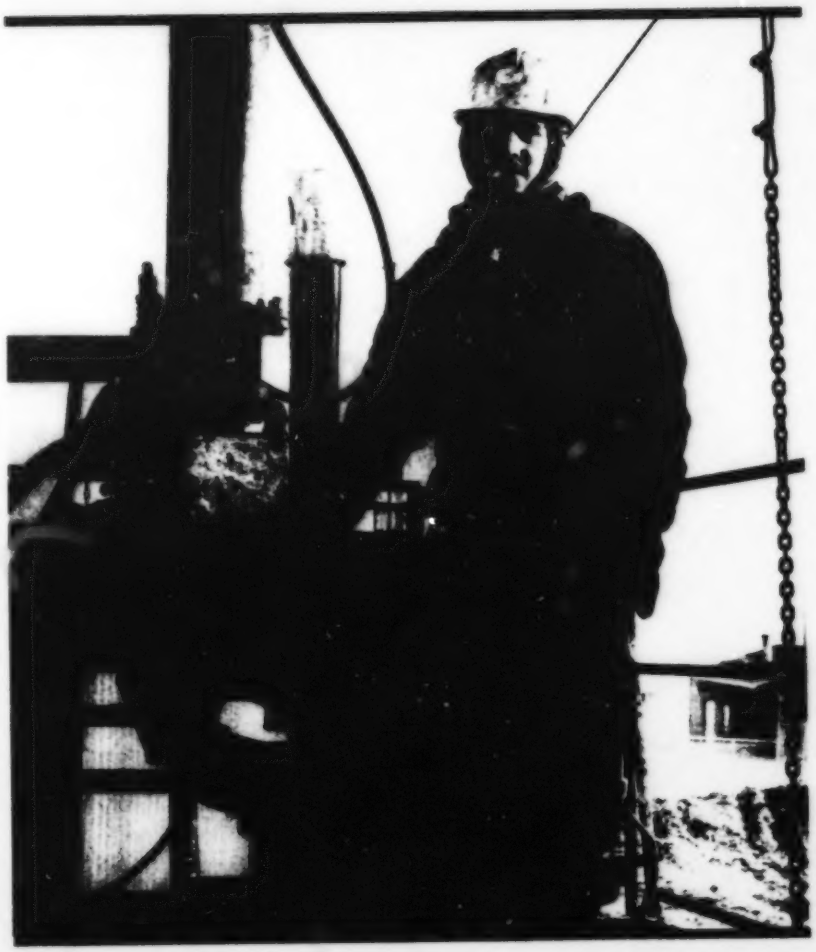
Except for four foreign personnel working on dredges in the Beaufort Sea, all employees in the oil and gas industry were Canadian; 30 per cent were Northerners.

The year 1987 was a turning point for benefits potential in the North; several companies announced new work programs, indicating a renewed interest in northern exploration and development.

East Coast Developments

In March, Petro-Canada announced that it would begin delineation of its 1984 discovery at Terra Nova. This news provided an excellent backdrop for the conference sponsored by the Newfoundland Ocean Industries Association, Newfoundland Offshore: Challenges for the Next Twenty Years, which focused on the economic exploitation of smaller offshore fields like Terra Nova which could use floating production systems.

Drilling and related activity continued steadily on the Grand Banks, and employment ranged from 300 to 450 people. Employment peaked between June and September when two rigs were active; 97 per cent of the workers were Canadian, 62 per cent were Newfoundlanders.



There was drilling in the Nova Scotia offshore between April and August. Employment ranged from 250 to 300 people, with peak employment occurring in May; 98 per cent of the work force was Canadian and 54 per cent Nova Scotian. This relatively low Nova Scotian rate is attributed to a drilling unit originating in Newfoundland and operated by Canadians from that province. Related activities created additional employment opportunities.

Brian Gaudet of Fort Franklin working on Shehtah Rig #2 at Norman Wells. Shehtah was incorporated in June 1983 as a joint venture of the Dene/Metis-owned company Deh Cho Drilling Ltd. and Esso Resources Canada Ltd. In 1987 it acquired a second service rig, and now has a drilling rig, two service rigs and 45 (primarily native) employees. More than 70 per cent of the employees are northerners and the new rig will increase the percentage. Shehtah has displayed excellent technical skill by drilling the world's longest known horizontal well: 1283 metres of the 1900-metre total length are horizontal. Courtesy Esso Resources Canada Limited.

Employment and Industrial Benefits

Canadian Market Opportunities Program

The Canadian Market Opportunities Program (CMOP) represents petroleum industry suppliers, buyers, contractors, consultants and associations. The program aims to increase the participation of Canadian suppliers in petroleum activities and to encourage development of domestic sources of supply for goods and services not currently provided by Canadians. Regional chapters throughout the country are carrying out CMOP objectives. The Atlantic chapter, one of the most active, has representatives from the Newfoundland Ocean Industries Association and the Offshore Trade Association of Nova Scotia, who are also directors on the national board.

At the CMOP annual meeting in Toronto, Gulf presented its purchasing and development plans for the Amauligak project, and Petro-Canada presented its plans for Terra Nova. These types of presentations offer Canadian suppliers and entrepreneurs early information on opportunities for business development.

Industry Initiatives

Under the lead of the Offshore Trade Association of Nova Scotia and with federal and provincial support, a dozen Nova Scotian suppliers undertook a trade mission to the United Kingdom, where North Sea development has opened up construction activities. The delegation visited fabrication yards in England and Scotland.

1987 PETROLEUM-RELATED EMPLOYMENT ON FRONTIER LANDS

	Total Work Force*	Canadian	Proportion Canadian
			(%)
Mainland Territories (Yukon and N.W.T.)	331	331	100
Mackenzie Delta and Beaufort Sea	652	648	99.4
Arctic Islands and Eastern Arctic Offshore	93	93	100
Grand Banks and Labrador Sea	516	496	96.1
Nova Scotia Offshore	445	435	97.8
Total	2 037	2 003	98.3

** Approximate number of jobs created.*

1987 PETROLEUM EXPENDITURES ON FRONTIER LANDS

	Exploration*	Development	Production	Total	Canadian	Proportion Canadian**
			($million)			(%)
Mainland Territories (Yukon and N.W.T.)	6.8	27.0	30.5	64.3	60.4	94.0
Mackenzie Delta and Beaufort Sea	108.8	—	—	108.8	87.0	80.0
Arctic Islands and Eastern Arctic Offshore	8.3	—	0.5	8.8	7.9	90.0
Grand Banks and Labrador Sea	200.0***	—	—	200.0	118.0	59.0
Nova Scotia Offshore	35.5	—	—	35.5	20.1	57.0
Total	359.4	27.0	31.0	417.4	293.4	70.3

** Includes geophysical expenditures. ** Historical estimates. *** Estimate.*

Regional Statistical Summary

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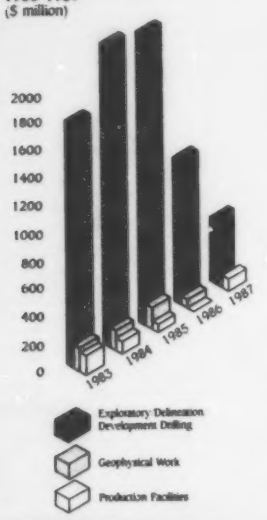
Frontier Lands

Statistical Summary

Petroleum Expenditures on Frontier Lands
1983-1987
($ million)



ACTIVITY STATUS ON FRONTIER LANDS	1983	1984	1985	1986	1987
Exploration Licences/Agreements Concluded	73	47	5	23	42
Wells Spudded	95	120	99	60	48
Metres Drilled	187 969	241 298	207 896	150 404	67 234
Wells Terminated	90	123	103	70	50
Significant Discoveries	5	11	15	14	1
Rig-Months	195	236	199	133	41
Geophysical Programs Run	84	65	55	15	7
km Shot	106 749	63 817	57 091	11 001	2 756*

** Includes 2273 km of aeromagnetic data.*

FRONTIER LANDS RESOURCE INVENTORY	OIL*		GAS	
	Discovered	Potential	Discovered	Potential
	(millions of m^3)		(billions of m^3)	
West Coast	0	50	0	270
Mainland Territories	37.2	95	20.8	312
Mackenzie Delta and Beaufort Sea	253.2	1 464	302.1	2 151
Arctic Islands and Eastern Arctic Offshore	65.7	873	416.4	3 156
Hudson Bay	0	127	0	88
Grand Banks and Labrador Sea	181.0	1 733	146.8	1 286
Nova Scotia Offshore	22.9**	318	160.9	663
Total	560.0	4 660	1 047.0	7 926

** Includes condensate.*
*** Mostly condensate with some oil.*

OIL AND GAS PRODUCTION ON FRONTIER LANDS	1983	1984	1985	1986	1987
Oil Production (thousands of m^3)					
Norman Wells	169	175	949	1 411	1 531
Bent Horn	—	—	29.5	17.5	34.5
Amauligak	—	—	—	50	—
Panuke	—	—	—	—	3.7
Gas Production (millions of m^3)					
Pointed Mountain	181	194	226	205	156
Norman Wells	46	41	227	188	163

Mainland Territories

Statistical Summary

ACTIVITY STATUS	1983	1984	1985	1986	1987
Wells Spudded					
Exploratory/Delineation	4	18	15	14	1
Development	57	67	39	14	35
Total	61	85	54	28	36
Wells Terminated*					
Exploratory/Delineation	3	15	17	14	2
Development	57	69	38	14	36
Total	60	84	55	28	38
Metres Drilled	48 598	80 804	53 924	36 289	31 132
Exploratory/Delineation	3 608	28 769	23 968	24 401	974
Development	44 990	52 035	29 956	11 888	30 158
Geophysical Programs Run	12	20	17	7	5
km Shot	2 720	5 371	5 819	2 095	2 422**

** In the mainland territories, where exploratory operations are generally restricted to the winter months, a well is deemed to be terminated in the year in which it reaches total depth, even though it may be reentered in the following year for testing.*

*** Includes 2273 km of aeromagnetic data.*

RESOURCES STATUS	1983	1984	1985	1986	1987**
Discovered Resources*					
Gas (billions of m^3)	30.5	21.2	21.4	20.3	20.8
Oil (millions of m^3)	44.2	52.3	51.0	51.0	37.2
Gas and Oil Production					
Pointed Mountain Gas (millions of m^3)	181	194	226	205	156
Norman Wells Gas (millions of m^3)	46	41	227	188	163
Norman Wells Oil (thousands of m^3)	169	175	949	1 411	1 531

** As reported in previous years.*

*** Includes new discoveries and revisions to previous estimates.*

BENEFITS STATUS	1983	1984	1985	1986	1987
Rigs Active	5	14	11	11	3
Rig-Months	27	47	31	33	13
Money Spent ($M)					
Geophysical	26.3	48.2	60.0	11.1	2.4
Exploratory/Delineation Drilling	12.5	49.5	69.3	54.1	4.4
Development Drilling	24.9	72.1	35.2	14.3	27.0
Production Facilities	159.8	86.1	23.5	5.6	30.5
Total	223.5	255.9	188.0	85.1	64.3

LAND STATUS	1983	1984	1985	1986	1987
Exploration Licences (ELs) Concluded	27	7	0	0	24
Total ELs Active*	27	34	34	30	29
Lands Negotiated into ELs (millions of ha)	7.4	1.4	0	0	4.5
Lands Relinquished/Surrendered (millions of ha)	N/A	0.1	3.1	3.3	4.7
Lands Active* (millions of ha)	13.7	12.3	9.2	5.7	2.3

** Includes declared significant discovery areas.*

Mainland Territories

Map No.	Name of Well	Latitude, Longitude	Drilling Unit	Spudded, Reentered, Terminated	Status, Results	Total Depth
						(m)
1.	Northcor et al. Liard F-25A	60°24'22"N 123°35'08"W	*Bawden 33*	86-08-05 87-02-25	Plugged & suspended, gas discovery	3 478
2.	Petro-Canada N. Cameron Hills C-24	60°03'12"N 116°50'03"W	*Tri-City 12*	87-08-26 87-09-14	Plugged & abandoned	974

In 1987 abandonment operations were completed for the Texaco Bovie Lake J-72 well.

Mackenzie Delta and Beaufort Sea

Statistical Summary

ACTIVITY STATUS	1983	1984	1985	1986	1987
Wells Spudded					
Exploratory/Delineation	11	6	19	17	3
Wells Terminated*					
Exploratory/Delineation	4	12	16	24	3
Metres Drilled					
Exploratory/Delineation	37 381	31 682	48 370	48 016	8 344
Geophysical Programs Run	9	13	8	5	1
km Shot	7 684	7 959	4 700	4 756	139

** In the Beaufort Sea, where operations are seasonal and could take place over a number of seasons for a given well, a well is deemed to be terminated in the year in which it reaches total depth.*

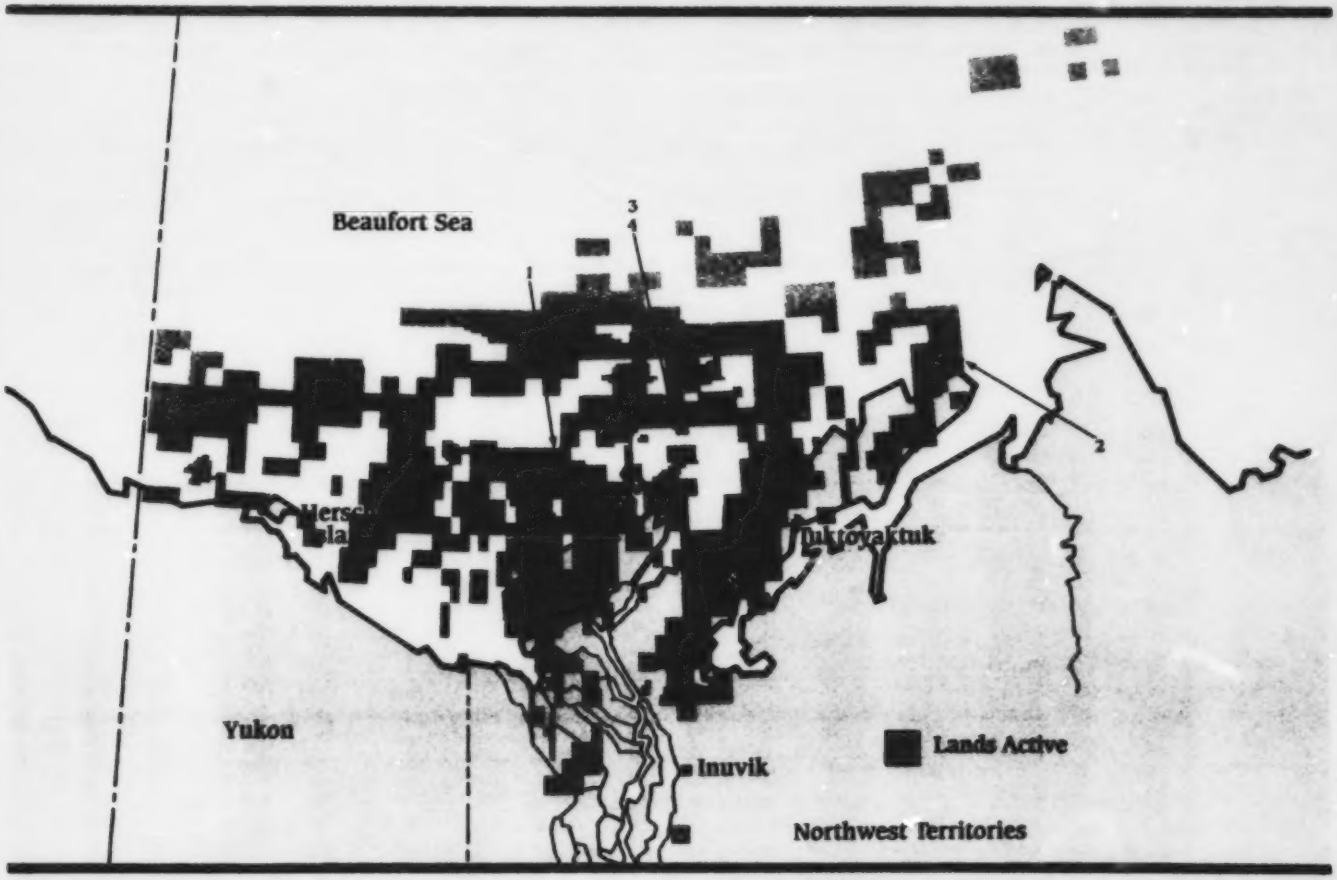
RESOURCES STATUS	1983	1984	1985	1986	1987**
Discovered Resources*					
Gas (billions of m^3)	286.5	279.5	284.2	292.8	302.1
Oil (millions of m^3)	133.0	130.4	183.1	193.2	253.2
Oil Production					
Amauligak (thousands of m^3)	—	—	—	50.4	—

** As reported in previous years.*
*** Includes new discoveries and revisions to previous estimates.*

BENEFITS STATUS	1983	1984	1985	1986	1987
Rigs Active	9	11	13	11	3
Rig-Months	31	39	43	43	5
Money Spent ($M)					
Geophysical	28.1	27.2	38.4	14.6	0.2
Exploratory/Delineation Drilling	629.8	786.4	760.5	391.5	108.6
Total	657.9	813.6	798.9	406.1	108.8

LAND STATUS	1983	1984	1985	1986	1987
Exploration Licences (ELs)					
Concluded	9	9	0	0	11
Total ELs Active*	15	24	23	23	28
Lands Negotiated into ELs					
(millions of ha)	6.8	1.8	0	0	2.1
Lands Relinquished/Surrendered (millions of ha)	N/A	0.3	1.6	3.1	1.4
Lands Active* (millions of ha)	9.2	8.9	7.3	4.2	2.9

** Includes declared significant discovery areas.*



Map No.	Name of Well	Latitude, Longitude	Drilling Unit	Spudded, Reentered, Terminated	Status, Results	Total Depth
						(m)
1.	Esso Home et al. Kaubvik I-43	69°52'33"N 135°25'19"W	*SCRI Esso Rig 3*	86-10-22 87-01-10	Plugged & abandoned	3 323
2.	Trillium Esso Chevron Angasak L-03	70°12'44"N 129°32'50"W	*Esso Rig 2*	87-02-24 87-04-12	Plugged & abandoned	2 334
3.	Gulf et al. Amauligak F-24 (Amauligak delineation)	70°03'17"N 133°37'48"W	*Molikpaq*	87-10-01 87-12-18	Plugged & suspended	5 260
4.	Gulf et al. Amauligak 2F-24 (Amauligak delineation)	70°03'17"N 133°37'48"W	*Molikpaq*	87-12-22	Drilling	750

Arctic Islands and Eastern Arctic Offshore

Statistical Summary

ACTIVITY STATUS	1983	1984	1985	1986	1987
Wells Spudded					
Exploratory/Delineation	4	3	3	2	1
Wells Terminated					
Exploratory/Delineation	5	4	3	2	1
Metres Drilled					
Exploratory/Delineation	12 087	11 007	6 185	4 940	689
Geophysical Programs Run	2	1	0	0	0
km Shot	1 142	601	0	0	0

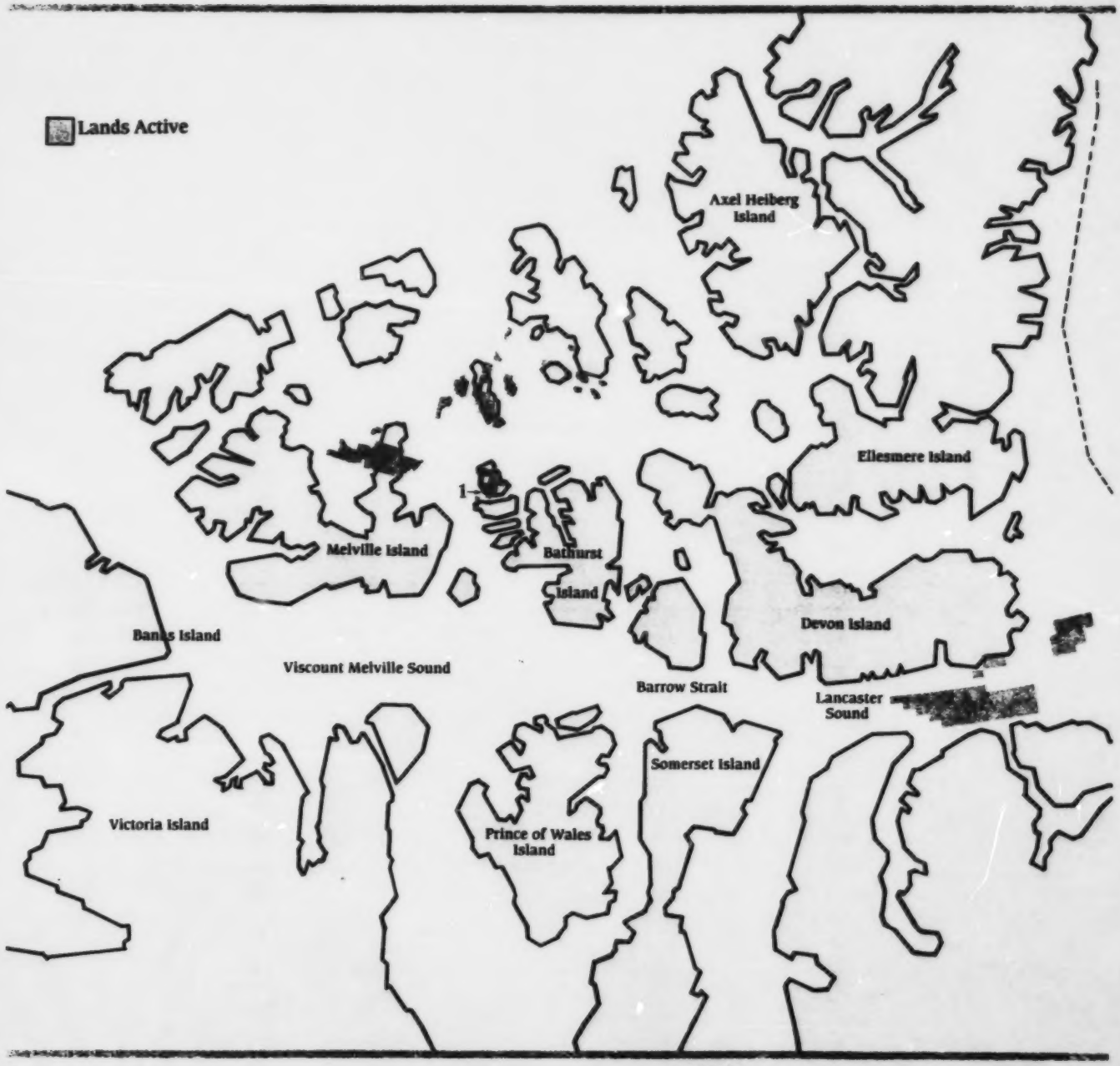
RESOURCES STATUS	1983	1984	1985	1986	1987**
Discovered Resources*					
Gas (billions of m^3)	372.2	390.1	415.7	416.4	416.4
Oil (millions of m^3)	76.1	49.3	65.7	65.7	65.7
Oil Production					
Bent Horn (thousands of m^3)	—	—	29.5	17.5	34.5

** As reported in previous years.*
*** Includes revisions to previous estimates.*

BENEFITS STATUS	1983	1984	1985	1986	1987
Rigs Active	4	4	3	2	1
Rig-Months	17	13	9	4	2
Money Spent ($M)					
Geophysical	6.2	4.6	0.2	0	0
Exploratory/Delineation Drilling	67.8	64.0	48.0	34.5	8.3
Production Facilities	0	0	7.8	0.6	0.5
Total	74.0	68.6	56.0	35.1	8.8

LAND STATUS	1983	1984	1985	1986	1987
Exploration Licences (ELs)					
Concluded	0	3	1	1	3
Total ELs Active*	21	24	25	21	16
Lands Negotiated into ELs					
(millions of ha)	0	1.5	0.7	0.9	0.3
Lands Relinquished/Surrendered (millions of ha)	N/A	0.9	1.4	8.9	5.9
Lands Active* (millions of ha)	17.3	15.8	15.1	7.5	1.6

** Includes declared significant discovery areas.*



Map No.	Name of Well	Latitude, Longitude	Drilling Unit	Spudded, Reentered, Terminated	Status, Results	Total Depth
						(m)
1.	Panarctic et al. Bent Horn F-72B	76°21'27"N 103°58'15"W	*Panarctic Rig C*	87-10-25 87-12-12	Plugged & suspended	3 278

In 1987 abandonment operations were completed for the Panarctic Bent Horn F-72A well.

Nova Scotia Offshore (includes the Gulf of St. Lawrence)

Statistical Summary

ACTIVITY STATUS	1983	1984	1985	1986	1987
Wells Spudded					
Exploratory/Delineation	12	14	10	6	3
Wells Terminated					
Exploratory/Delineation	11	13	14	8	3
Metres Drilled					
Exploratory/Delineation	60 088	71 046	47 064	29 744	9 583
Geophysical Programs Run	38	17	14	2	1
km Shot	38 495	21 587	26 814	613	195

RESOURCES STATUS	1983	1984	1985	1986	1987**
Discovered Resources*					
Gas (billions of m^3)	108.7	122.6	127.4	150.6	160.9
Condensate and					
Oil (millions of m^3)	13.7	16.7	20.0	22.1	22.9
Oil Production					
Panuke (thousands of m^3)	N/A	N/A	N/A	N/A	3.7

** As reported in previous years.*
*** Includes new discoveries and revisions to previous estimates.*

BENEFITS STATUS	1983	1984	1985	1986	1987
Rigs Active	9	10	8	5	2*
Rig-Months	72	83	50	22	5
Money Spent ($M)					
Geophysical	50.5	23.2	29.2	0.9	0.2
Exploratory/Delineation Drilling	579.4	594.7	452.0	176.8	35.3
Total	629.9	617.9	481.2	177.7	35.5

** One rig worked off both Nova Scotia and Newfoundland.*

LAND STATUS	1983	1984	1985	1986	1987
Exploration Agreements (EAs)					
Concluded	5	15	2	13	3
Total EAs Active*	25	30	28	15	17
Lands Negotiated into EAs					
(millions of ha)	0.5	10.5	0.9	1.7	0.3
Lands Relinquished/Surrendered (millions of ha)	1.6	8.5	2.8	3.2	1.1
Lands Active* (millions of ha)	20.0	6.3	4.2	1.1	0.7

** Includes declared significant discovery areas.*

Quebec
Newfoundland
Îles-de-la-Madeleine
Prince Edward Island
New Brunswick
Nova Scotia
Sable Island
2
3
1
Atlantic Ocean
Lands Active

Nova Scotia Offshore (including the Gulf of St. Lawrence)

Map No.	Name of Well	Latitude, Longitude	Drilling Unit	Spudded, Reentered, Terminated	Status, Results	Total Depth
						(m)
1.	Canterra et al. Whycocomagh N-90	43°39'51"N 60°28'04"W	*Sedco 710*	87-04-20 87-05-26	Plugged & abandoned	3 536
2.	Petro-Canada et al. Como P-21	43°50'46"N 60°48'19"W	*Rowan Gorilla I*	87-05-14 87-06-29	Plugged & abandoned	3 540
3.	Petro-Canada et al. Panuke F-99 (Panuke delineation)	43°48'25"N 60°44'34"W	*Rowan Gorilla I*	87-07-02 87-08-24	Plugged & suspended, oil	2 507

Appendix

Newfoundland Offshore (1986 and 1987 data verified by the Canada-Newfoundland Offshore Petroleum Board)

Statistical Summary

ACTIVITY STATUS	1983	1984	1985	1986	1987
Wells Spudded					
Exploratory/Delineation	7	12	11	7	5
Wells Terminated					
Exploratory/Delineation	10	10	13	8	5
Metres Drilled					
Exploratory/Delineation	29 615	46 759	49 098	31 415	17 486
Geophysical Programs Run	21	12	16	1	0
km Shot	48 261	27 808	19 758	3 537	0

RESOURCES STATUS	1983	1984	1985	1986	1987**
Discovered Resources*					
Gas (billions of m^3)	126.7	145.2	152.4	146.8	146.8
Oil (millions of m^3)	211.5	159.9	185.1	176.5	181.0

** As reported in previous years.*
*** Includes new discoveries and revisions to previous estimates.*

BENEFITS STATUS	1983	1984	1985	1986	1987
Rigs Active	9	9	8	6	2*
Rig-Months	48	54	63	31	16
Money Spent ($M)					
Geophysical	57.4	27.8	27.3	4.1	0
Exploratory/Delineation Drilling	436.9	485.9	630.0	347.0	200**
Total	494.3	513.7	657.3	351.1	200**

** One rig worked off both Newfoundland and Nova Scotia.*
*** Estimate.*

LAND STATUS	1983	1984	1985	1986	1987
Exploration Licences (ELs)					
Concluded	32	13	0	9	1
Total ELs Active*	32	41	38	27	21
Lands Negotiated into ELs					
(millions of ha)	10.3	6.0	0	1.5	0.1
Lands Relinquished/Surrendered (millions of ha)	N/A	8.6	10.9	9.2	1.8
Lands Active* (millions of ha)	24.6	22.0	11.9	3.4	1.7

** Includes declared significant discovery areas.*

Newfoundland Offshore (1986 and 1987 data verified by the Canada-Newfoundland Offshore Petroleum Board)

Map No.	Name of Well	Latitude, Longitude	Drilling Unit	Spudded, Reentered, Terminated	Status, Results	Total Depth (m)
1.	HBV et al. Golconda C-64	46°53'12"N 47°39'57"W	*Bow Drill 3*	86-10-05 87-02-01	Plugged & abandoned	4 451
2.	HBV et al. Bonne Bay C-73	46°32'11"N 48°11'31"W	*Bow Drill 3*	87-02-04 87-07-17	Plugged & abandoned	4 205
3.	Petro-Canada et al. Terra Nova H-99 (Terra Nova delineation)	46°28'29"N 48°28'50"W	*Sedco 710*	87-06-13 87-07-03 87-10-02 87-12-05	Plugged & suspended, oil	3 510
4.	Northcor et al. Narwhal F-99	44°18'22"N 53°44'35"W	*Sedco 710*	87-07-17 87-09-23	Plugged & abandoned	4 585
5.	HBV et al. North Ben Nevis M-61 (North Ben Nevis delineation)	46°40'54"N 48°25'19"W	*Bow Drill 3*	86-01-09 86-03-31 87-07-20 87-08-17	Plugged & abandoned, oil and gas	3 422
6.	HBV et al. Whiterose E-09 (Whiterose delineation)	46°48'26"N 48°01'23"W	*Bow Drill 3*	87-08-20 87-11-11	Plugged & suspended	3 811
7.	Petro-Canada et al. Terra Nova C-09 (Terra Nova delineation)	46°28'10"N 48°30'58"W	*Sedco 710*	87-12-13	Drilling	592

Glossary of Terms

Abandoned Well: Any well that has been permanently plugged.

Benefits Plan: A plan submitted by operators and approved by the Minister that states the employment and procurement intentions of operators related to their exploration and development activities on frontier lands.

Berm: A submerged artificial island constructed from dredged material and designed to form a base for bottom-founded mobile structures.

Completed Well: A well that has been drilled and equipped so that it is capable of producing oil or gas.

Cubic Metre of Gas: Equivalent to 35.301 cubic feet at 14.73 pounds per square inch (760 mm of Hg) of atmospheric pressure at sea level.

Cubic Metre of Oil: Equivalent to 6.2898 American stock tank barrels.

Delineation Well: A well drilled as a follow-up, or extension to a significant discovery on the same geological feature, with the purpose of determining the extent and commercial potential of the oil or gas accumulation encountered in the discovery well.

Development Plan: A plan describing the wells and other facilities proposed to develop a field.

Drillstem Test: A test involving temporary completion of a well to evaluate fluid flow rates and to collect fluid samples.

Dry Hole: A well that has failed to find significant amounts of oil or gas.

Exploration Licence: A licence granting the right to explore for, and the exclusive right to drill and test for, petroleum, and the exclusive right to obtain a Production Licence subject to compliance with the other provisions of the Canada Petroleum Resources Act (formerly called an Exploration Agreement under the Canada Oil and Gas Act).

Exploratory Well: A well drilled on a geological feature where no significant discovery has previously been made (synonymous with wildcat well).

Extended Flow Test: A prolonged drillstem test.

Floating Production System: A floating platform equipped to receive oil or gas through flowlines from offshore wells.

Formation Testing: The gathering of data on a formation to determine its potential productivity.

Geopressure: Abnormally high pressure exerted by some subsurface formations.

Hectare (ha): 10 000 square metres (equivalent to 2.47 acres).

Hydrocarbon: A naturally occurring compound consisting primarily of atoms of hydrogen and carbon, in solid, liquid or gaseous form.

Ice Platform: A specially thickened platform made of ice which supports a conventional land drilling rig thereby enabling a well to be drilled in deep water between arctic land masses.

Infill Drilling: Drilling of wells between existing wells to better exploit the reservoir.

Injection Well (Injector): A well in which fluids have been injected into an underground formation to increase reservoir pressure.

Miscible Flooding: Method of enhanced recovery in which various hydrocarbon solvents or gases are injected into the reservoir to help displace oil from the reservoir rock.

Mobile Arctic Caisson: An annular steel caisson (better known as the *Molikpaq*), with deck dimensions of 75 m × 73 m, which is designed to be set down on an underwater berm.

Mobile Offshore Drilling Unit (MODU): Any vessel capable of engaging in drilling operations for the exploration for, or the exploitation of, resources beneath the seabed.

Reflection Seismic: The primary geophysical technique used in petroleum exploration for mapping subsurface geophysical features. Acoustic pulses are created at the surface and then the pulses reflected from layers of different acoustic properties within the earth are measured.

Rights Issuance: The granting of a licence, usually exploration, on frontier or Crown reserve lands.

Screening Statement: Preliminary outline of environmental issues and possible impacts associated with hydrocarbon projects.

Semisubmersible: A MODU that is stabilized by ballasting its pontoons (base) and columns to a predetermined depth during drilling operations. Used extensively in rough seas and deep waters.

Significant Discovery: A discovery indicated by the first well on a geological feature that demonstrates by flow testing the existence of hydrocarbons in that feature and suggests the existence of an accumulation that has potential for sustained production.

Spud: To start the drilling of a well.

Suspended Well: A well in which drilling or production operations have temporarily ceased.

Terminated Well: A well that has reached total depth and has been abandoned, completed or suspended.

Waterflood: A method of recovery in which water is injected into a reservoir to remove additional quantities of oil from the reservoir.

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